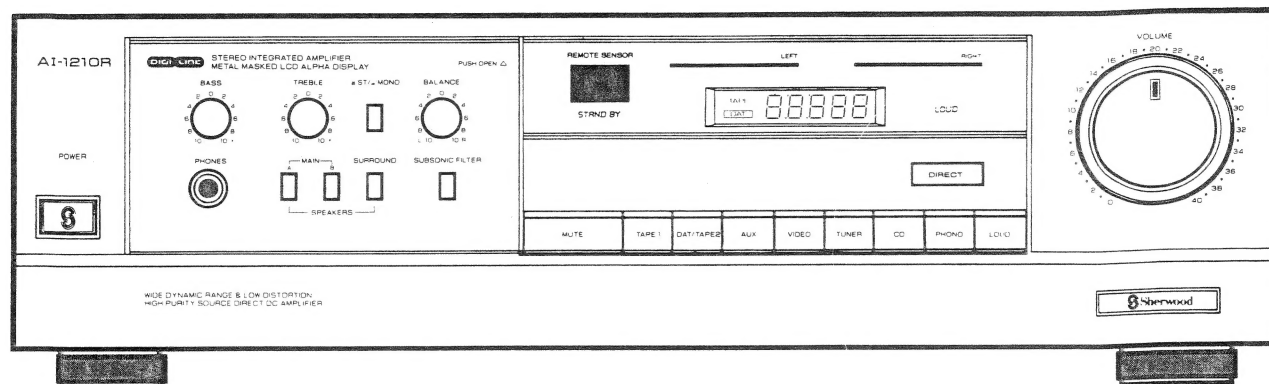


# SERVICE MANUAL

## AI-1210R

### STEREO INTEGRATED AMPLIFIER



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#### NOTICE

- This manual is for authorized and qualified service personnel, so the basic service procedure and commonsense of safety are not described in this manual.
- Sherwood always makes every endeavor to improve the products, therefore the specifications and data provided are subject to change without notice.



# To Service Personnel

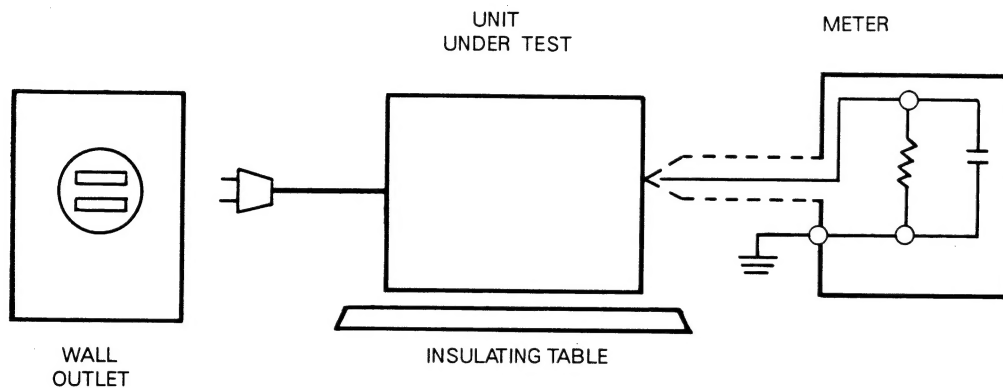
## 1. Critical Components Information.

The  $\triangle$  marked components on schematic diagram and parts list be replaced with the parts having specifications equal to these originally installed.

## 2. Leakage Current Measurement(For 120V Version only).


When the service has been completed, make sure that all exposed conductive surfaces are properly insulated from the power supply circuits.


- Leakage current meter should have an input impedance of 1500 ohms resistive shunted by  $0.15\mu\text{F}$  capacitor.
- Leakage current shall not be exceed 0.5mA.



3. Turn the unit OFF, and disconnect the power supply cord during disassembly and replacement of parts.

4. When the service has been completed, be sure to check all protective device and spacings before returning the unit to customer.

5.  This symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock hazard to persons.

6.  This symbol is intended to alert the user to the presence of important operating and maintenance(servicing) instructions in the literature accompanying the appliance.

7. Caution: To prevent electric shock do not use this(polarized) plug with an extension cord, receptacle or other outlet unless the blades can be fully inserted to prevent blade exposure.

# Specifications

## IHF/EIA Version

Minimum Continuous Average Power Output per Channel, both channels driven with no more than 0.06% THD

at 8 ohms, 1 kHz.....	105W
at 8 ohms, 20-20,000 Hz.....	100W
Intermodulation Distortion, 60 Hz:7 kHz=4:1 SMPTE	
100W output into 8 ohms.....	0.05%
Damping Factor at 1 kHz, 8 ohms.....	70
Input Sensitivity for 100W output,8 ohms at 1 kHz	
PHONO.....	2.5mV
AUX/TUNER.....	150mV
Phono Preamp Input Overload	
at 1 kHz, 0.1% THD.....	170mV
at 10 kHz, 0.1% THD.....	750mV
Signal to Noise Ratio,IHF "A" wtd/unwtd	
PHONO.....	74/66 dB
AUX (CD/VIDEO).....	92/85 dB
Frequency Response	
PHONO, RIAA 40-20,000 Hz.....	± 0.5 dB
AUX at 1W, -3 dB.....	5 Hz-50 kHz
Loudness Contour, at 100 Hz.....	+7 dB
Tone Control	
Bass, at 100 Hz.....	± 10 dB
Treble, at 10 kHz.....	± 10 dB
Channel Separation at AUX	
at 100 Hz.....	50 dB
at 1 kHz.....	45 dB
at 10 kHz.....	40 dB
Power Consumption.....	130W(MIN 20W, MAX 370W)

## DIN/IEC Version

Power Output per Channel	
IEC standard, 63 Hz-12.5 kHz at 8 ohms.....	110W
DIN standard, 1 kHz at 8 ohms.....	115W
Total Harmonic Distortion, -6 dB Rated Output, 1 kHz at 8ohms.....	0.01%
Intermodulation, -6 dB Rated Output,at 8 ohms.....	0.009%
Damping Factor, 1 kHz at 8 ohms.....	70
Input Sensitivity for 100W output, 1 kHz at 8 ohms	
PHONO.....	2.5mV
AUX/TUNER.....	150mV
Phono Preamp Input	
at 10 kHz, 0.1% THD.....	750mV
Signal to Noise Ratio, IEC "A" wtd/unwtd	
PHONO: 5mV input, 2.2 kohm shorted, VOL adj. 100W.....	74/66 dB
AUX: 500mV input, 22 kohm shorted, VOL adj. 100W.....	94/88 dB
Frequency Response	
PHONO, RIAA 40-20,000 Hz.....	± 0.5 dB
AUX at 1W, -3 dB.....	5 Hz-50 kHz
Loudness Contour at 100 Hz.....	± 7 dB
Tone Control	
Bass at 100 Hz.....	± 10 dB
Treble at 10 kHz.....	± 10 dB
Power Consumption.....	370W MAX(MIN 20W)

## General Specifications

Dimensions.....	(W)440×(H)118×(D)330 mm (W)17.3×(H)4.6×(D)13.0 inch
Weight.....	12.5kg (27.5lbs,441 ozs)

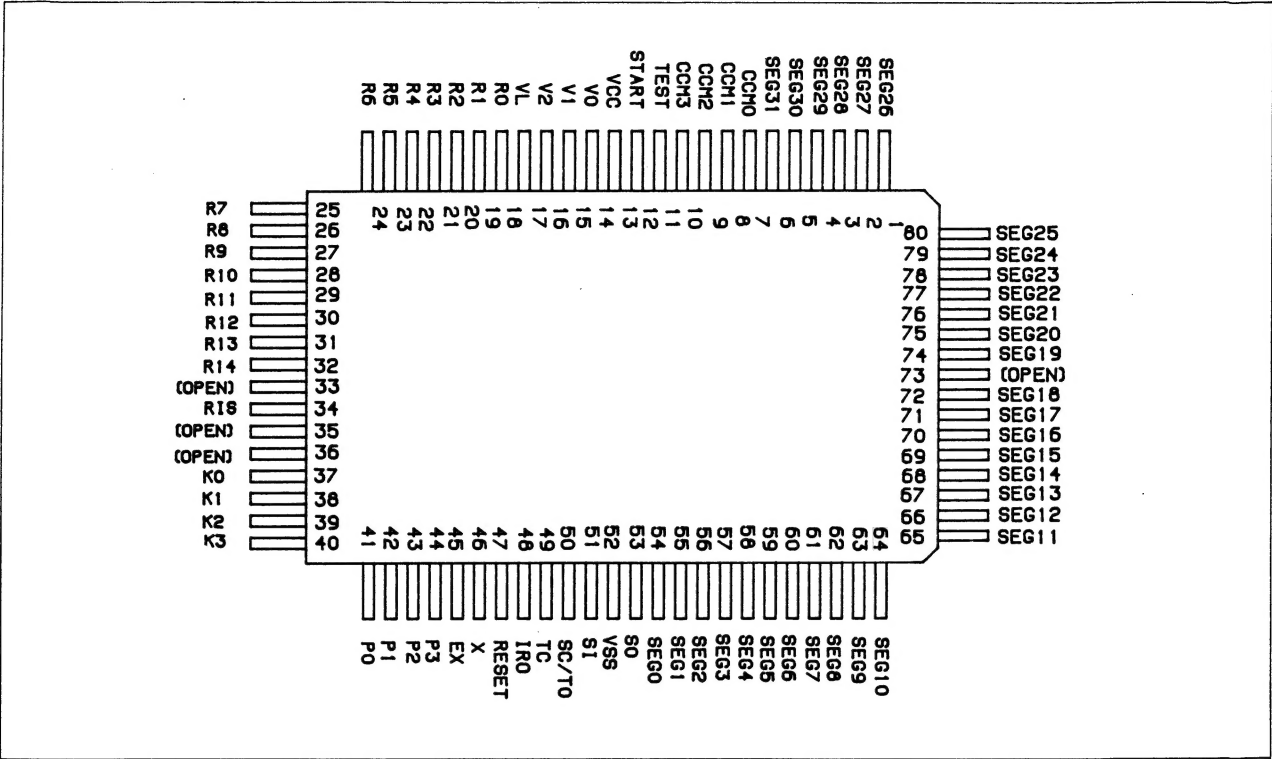
### Power Requirements

A : USA/CANADIAN MODEL.....	120V AC/60 Hz
B : MULTI-VOLTAGE MODEL.....	120/220V AC, 60/50 Hz
C : GENERAL EUROPEAN MODEL.....	220V AC/50 Hz
D : WEST GERMAN & ITALIAN MODEL.....	220V AC/50 Hz
E : BRITISH & AUSTRALIAN MODEL.....	240V AC/50 Hz
F : SWISS & SCANDINABIAN COUNTRY.....	220V AC/50 Hz

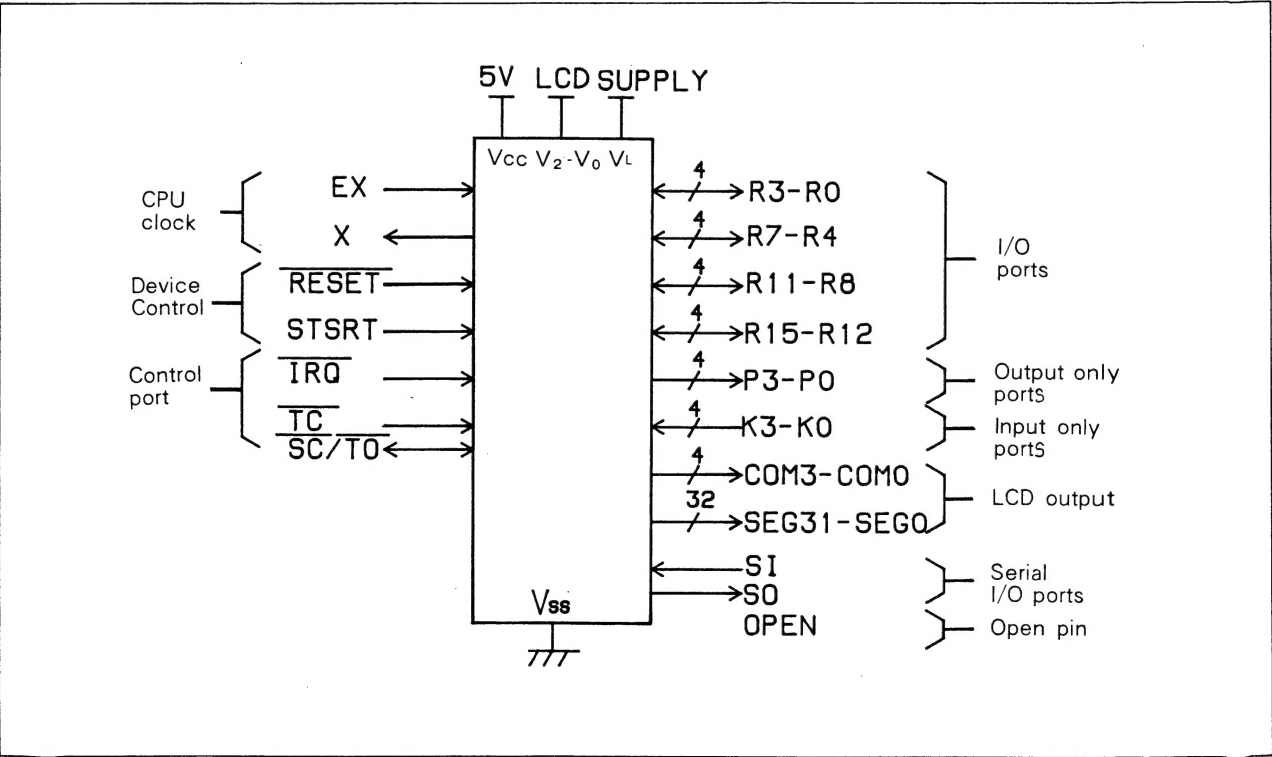
Note: Specifications and Design.subject to change without notice for improvements.

# Circuit Description

– Pin Assignment(MB 88543:IC 403)

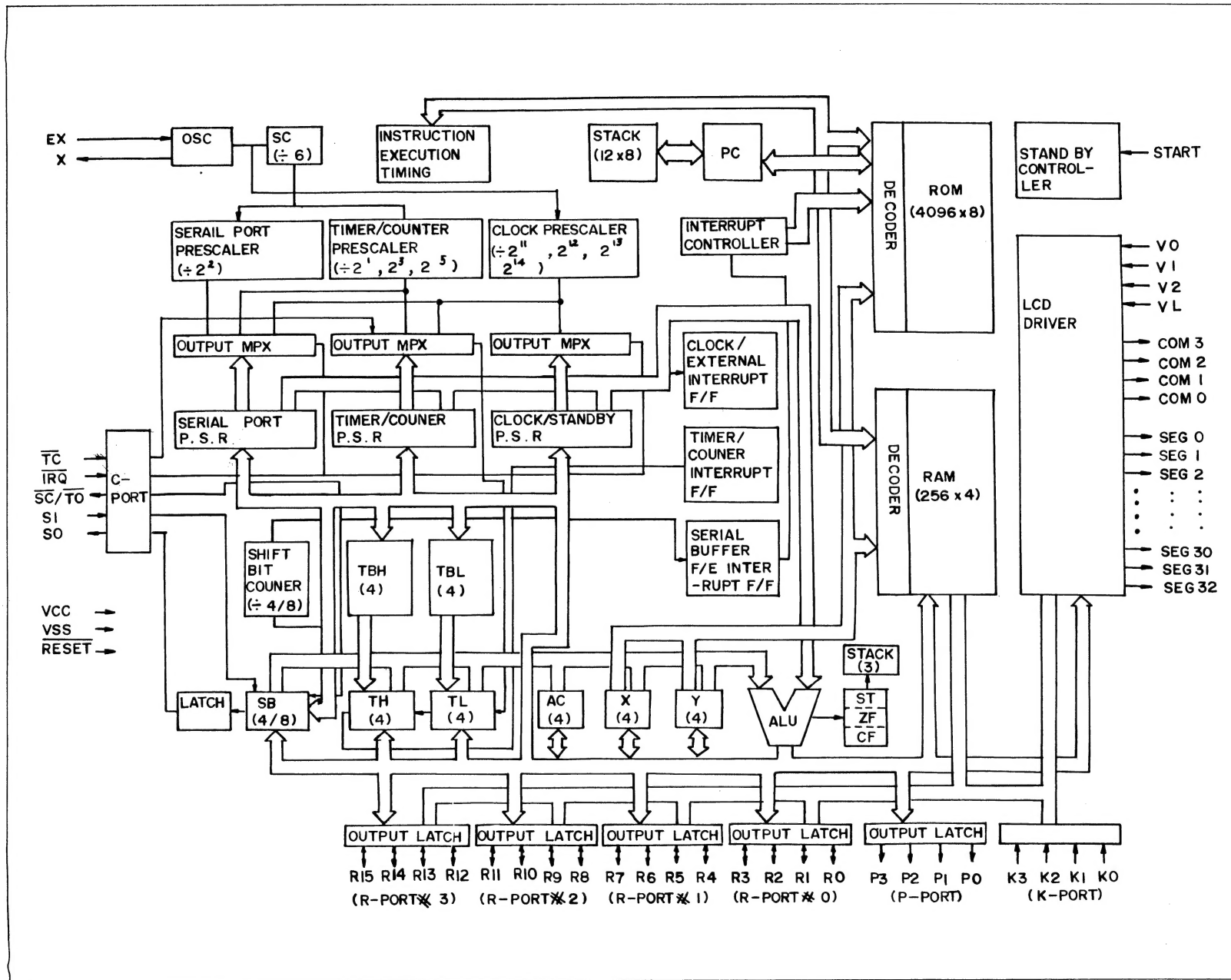


– Logic Symbol

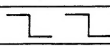
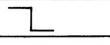
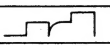
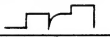
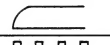
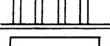

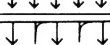
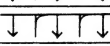
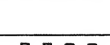

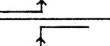
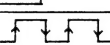
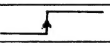
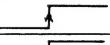
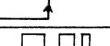
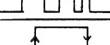
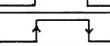
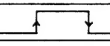

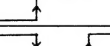
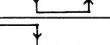
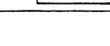
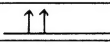

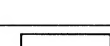
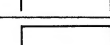
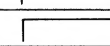
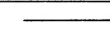



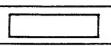
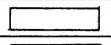
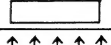
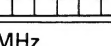
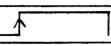
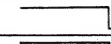
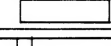
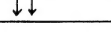
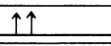


Internal Block Diagram: IC 403

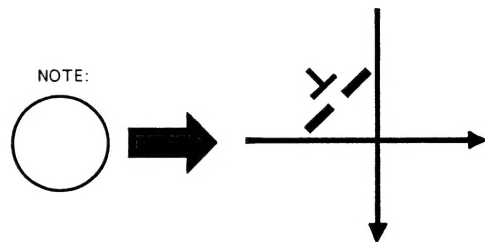
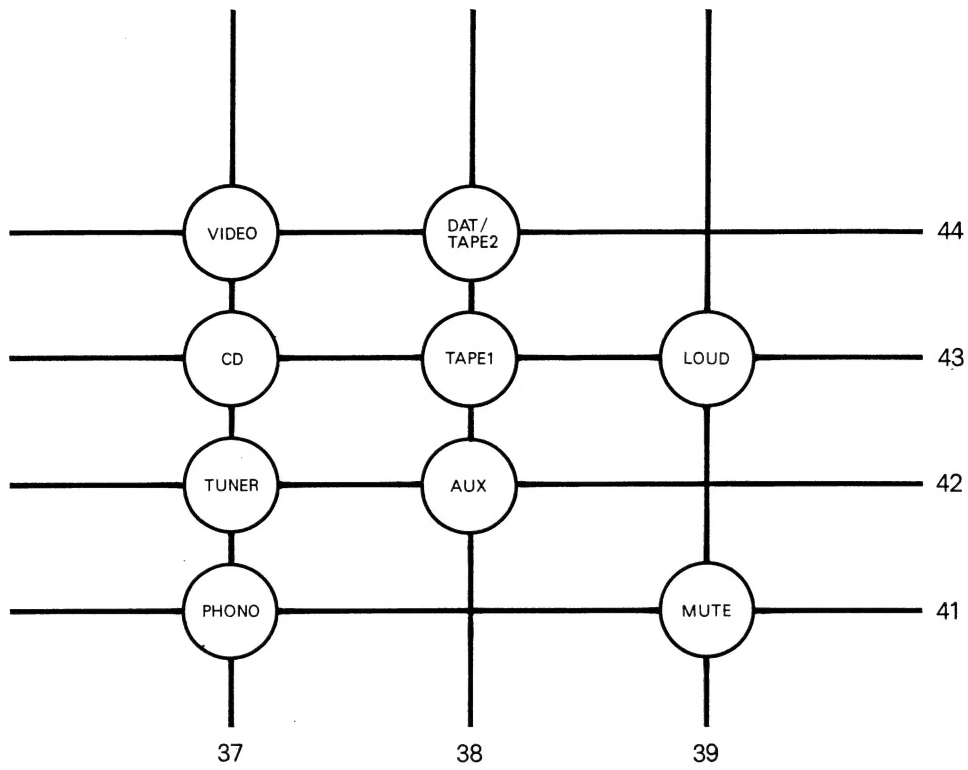


— Functions Assigned (MB 88453:IC 403)

No	Terminal	Operating	Remarks
1	Segment		LCD
2	out put		
3			
4			
5			
6			
7	Common output		LCD
8	Common output		LCD
9	Common output		
10	Common output		
11	Test		
12	Start		Q452
13	VCC		
14	V <sub>0</sub>		
15	V <sub>1</sub>		
16	V <sub>2</sub>		
17	V <sub>L</sub>		
18	R <sub>0</sub> (NEC Cord)		IC403
19	R <sub>1</sub> (Loud)		Q401, Q402
20	R <sub>2</sub> (-20dB)		Q703L/R
21	R <sub>3</sub> (OSC)		Q403
22	R <sub>4</sub> (VOL up)		Q406
23	R <sub>5</sub> (VOL down)		Q407
24	R <sub>6</sub> (DAT)		Q410
25	R <sub>7</sub> (philps Cord)		only CP player
26	R <sub>8</sub> (A)		IC402
27	R <sub>9</sub> (B)		IC402
28	R <sub>10</sub> (C)		IC402
29	R <sub>11</sub> (D)		IC402
30	R <sub>12</sub> (MUTE)		Q415
31	R <sub>13</sub> (power on/off)		
32	R <sub>14</sub> (stand by)		Q451
33	OPEN		
34	(STROB)		IC202
35	OPEN		
36	OPEN		
37	K0		key MATRIX
38	K1		
39	K2		
40	K3		

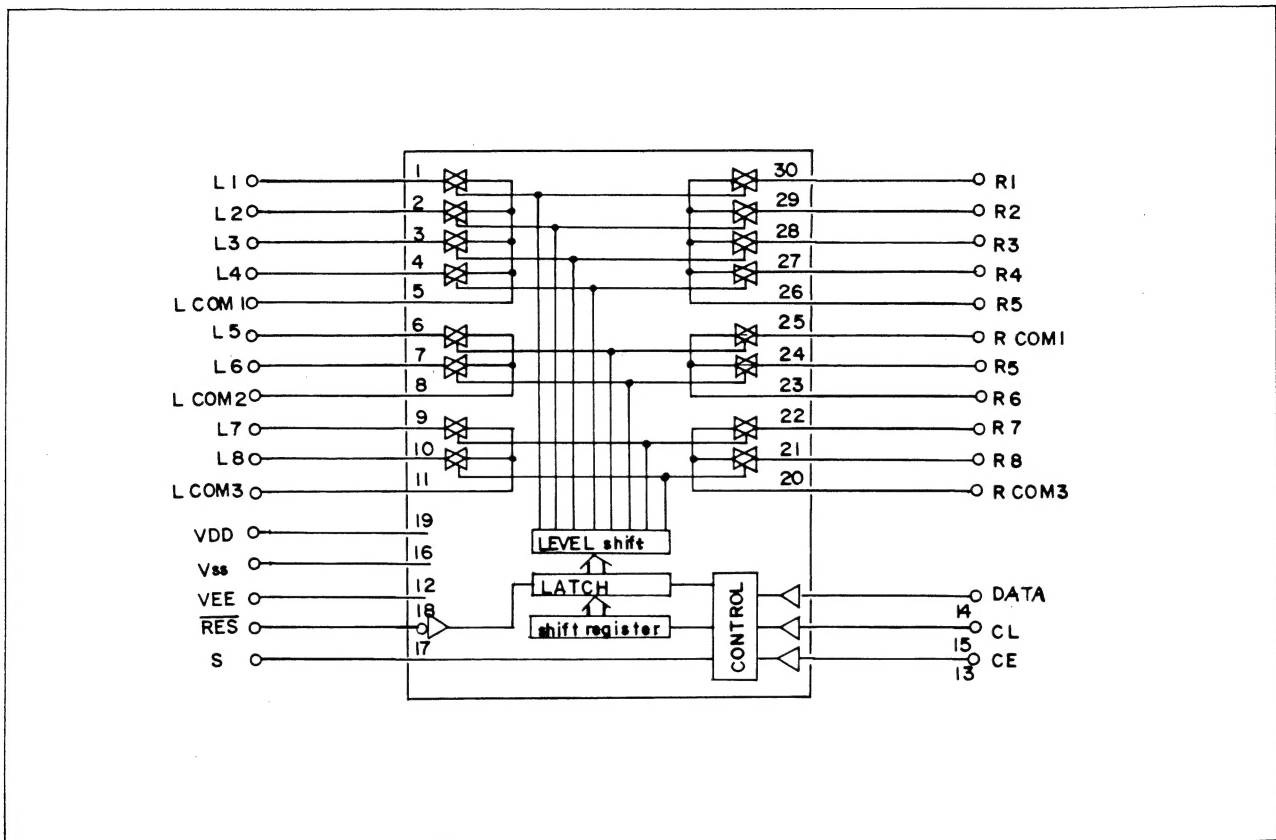
No	Terminal	Operating	Remarks
41	P0		key MATRIX
42	P1		
43	P2		
44	P3		
45	EX	6MHz	
46	X	OSC	
47	RESET		
48	IRQ		
49	TC		
50	SC/TO (clock)		IC202
51	SI		
52	VSS		
53	SO (DATA)		IC202
54	Segment output		LCD
55			
56			
57			
58			
59			
60			
61			
62			
63			
64	Segment output		LCD
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			
75			
76			
77			
78			
79			
80			

—Key Matrix



# IC Lead Identification

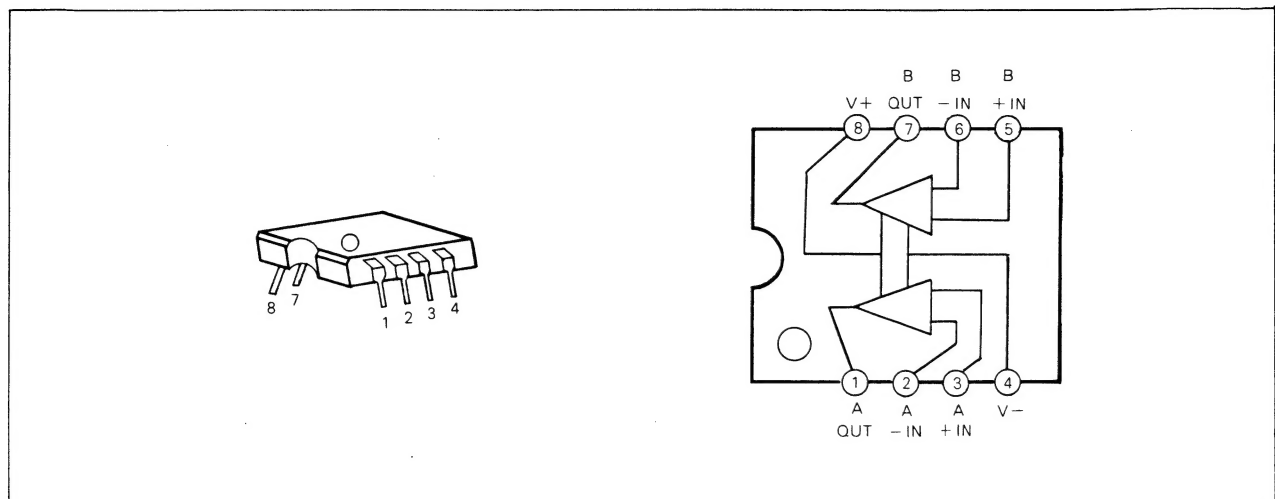
– LC 7821:IC 202(Switching IC)



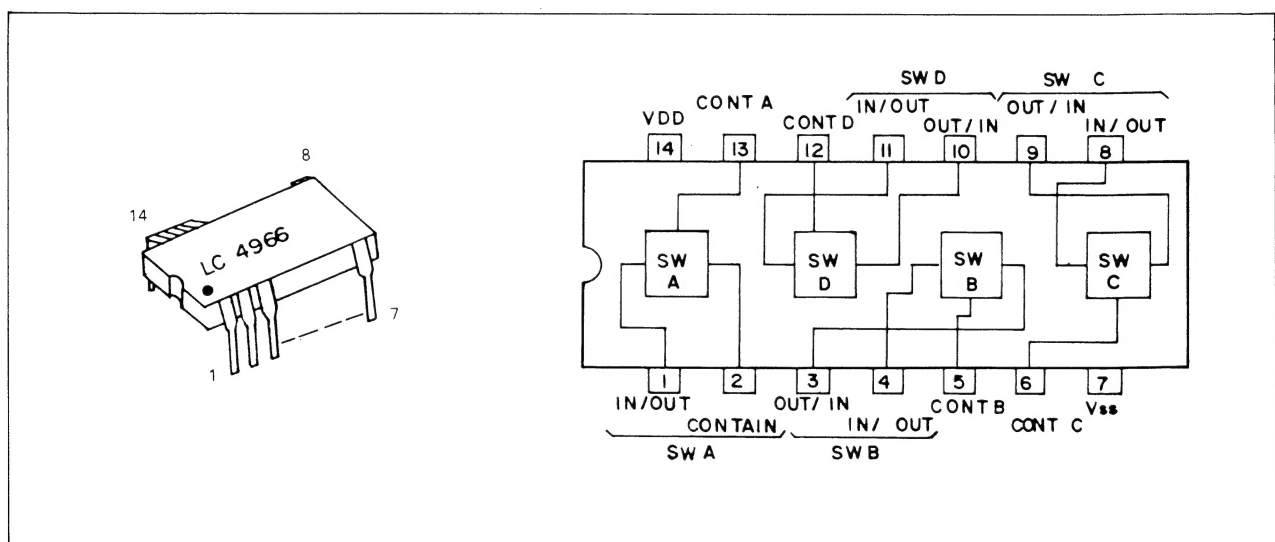
PIN NO.	TERMINAL	DESCRIPTION
1	CD	input output terminais of audio signal of left channel
2	PHONO	
3	TUNER	
4	AUX	
5		
6	VIDEO	
7		
8	TAPE OUTPUT	
9		
10	TAPE INPUT	
11	DAT OUTPUT	
12	VEE	Negative power Supply terminal—15V
13	STROBE	Setial Control terminal
14	DATA	Connect terminal of MB88P 515B
15	CLOCK	
16	VSS	Ground terminal
17	S	

PIN NO.	TERMINAL	DESCRIPTION
18	RES	Reset terminal When power is turned ON. the Condition of the analog switch is not determined. but when this teminal is L all analog switches are. OFF
19	VDD	Power Supply terminal(-15)
20	DAT OUTPUT	Input Output terminals of audio signal of right channel
21	TAPE INPUT	
22		
23	TAPE OUTPUT	
24		
25	VIDEO	
26		
27	AUX	
28	TUNER	
29	PHONO	
30	CD	

– NJM 4560D/NJM 2068:IC 201,204(OP AMP)



– LC 4966:IC 203(Analog Switch)



# Electrical Parts List

## MAIN BOARD 4002117900

Ref. No	Parts No.	Description	Position	Remark
• Capacitors				
C000	3479210071	Electric 10 $\mu$ F 50V	D	
C100	3509103450	Ceramic 0.01 $\mu$ F 500V	D	
C101	3509103450	Ceramic 0.01 $\mu$ F 500V	D	
C102	3549472407	Ceramic 0.047 $\mu$ F 400V	D	
C103	3509103450	Ceramic 0.01 $\mu$ F 500V	D	
C104	3509103450	Ceramic 0.01 $\mu$ F 500V	D	
C105	3479247131	Electric 470 $\mu$ F 16V	D	
C106	3479247971	Electric 4.7 $\mu$ F 50V	D	
C107	3479247971	Electric 4.7 $\mu$ F 50V	D	
C108	3479247041	Electric 47 $\mu$ F 25V	D	
C109	3479247061	Electric 47 $\mu$ F 35V	D	
C110	3409247161	Electric 470 $\mu$ F 35V	D	
C111	3409247161	Electric 470 $\mu$ F 35V	D	
C112	3479222061	Electric 22 $\mu$ F 35V	D	
C113	3479222061	Electric 22 $\mu$ F 35V	D	
C201	3419582280	Electric 8200 $\mu$ F 63V	D	
C300L/R	3579151130	Ceramic 150pF 50V	C	
C301L/R	3479247971	Electric 4.7 $\mu$ F 50V	C	
C302L/R	3409247061	Electric 47 $\mu$ F 35V	C	
C303L/R	3579101130	Ceramic 100pF 50V	C	
C304L/R	3579471130	Ceramic 470pF 50V	C	
C305L/R	3579150130	Ceramic 15pF 50V	C	
C306L/R	3579150130	Ceramic 15pF 50V	C	
C309L/R	3579473530	Ceramic 0.047 $\mu$ F 50V	C	
C311L/R	3579473530	Ceramic 0.047 $\mu$ F 50V	C	
C312L/R	3579101130	Ceramic 100pF 50V	C	
C314L/R	3479247871	Electric 0.47 $\mu$ F 50V	C	
C315	3579821130	Ceramic 820pF 50V	C	
C316	3409247111	Electric 470 $\mu$ F 6.3V	C	
C317	3409210161	Electric 100 $\mu$ F 35V	C	
C318L/R	3579101130	Ceramic 1000pF 50V	C	
C331L/R	3579509130	Ceramic 5pF 50V	C	
C340L/R	3579150130	Ceramic 15pF 50V	C	
C350L/R	3409210121	Electric 100 $\mu$ F 10V	C	
C360L/R	3579220130	Ceramic 22pF 50V	C	
• Diodes				
D101	2258106100	1N 4002	D	
D102	2258106100	1N 4002	D	
D103	2258106100	1N 4002	D	
D104	2258106100	1N 4002	D	
D105	2258106100	1N 4002	D	
D106	2258106100	1N 4002	D	
D107	2258106100	1N 4002	D	
D108	2258106100	1N 4002	D	
D109	2258106100	1N 4002	D	
D110	2258106100	1N 4002	D	
D111	2258106100	1N 4002	D	
D141	2058599105	Zener, DZ6.2BM	D	
D301L/R	2058599115	Zener, DZ27BM	D	
D303L/R	2258306101	1N 4148	C	
D304L/R	2258306101	1N 4148	C, D	
D305L/R	2258106101	1N 4002	C, D	
D306L/R	2258106101	1N 4002	C	
D307L/R	2258306101	1N 4148	C	
D308L/R	2258306101	1N 4148	C	
D309	2258599109	Zener, DZ15BM	C	
D310	2258106101	1N 4002	C	
D311	2258106101	1N 4002	C	
D313L/R	2258306101	1N 4148	C	
D314L/R	2258306101	1N 4148	C	
• Fuses				
F103	5508212031	STD 1A 250V	D	A, B
F103	5508301634	T-type, 500mA 250V AC	D	C, D, E, F
F103	5508212030	STD 1A 250V	D	Domestic
F104	5508212031	STD 1A 250V	D	A, B

Ref. No	Parts No.	Description	Position	Remark
F104	5508301634	T-type, 500mA 250V AC	D	C, D, E, F
F104	5508212030	STD 1A 250V	D	Domestic
F201	5508213133	STD 6A 250V	D	A, B
F201	5508303234	T-type, 6.3A 250V AC	D	C, D, E, F
F201	5508213130	STD 6A 250V	D	Domestic
F202	5508213133	STD 6A 250V	D	A, B
F202	5508303234	T-type, 6.3A 250V AC	D	C, D, E, F
F202	5508212030	STD 6A 250V	D	Domestic
• ICs				
IC101	2168601101	GD7805, Regulator	D	
IC102	2168601106	GD7818, Regulator	D	
IC103	2168600106	MC7918, Regulator	D	
• Resistors				
R000	3069243970	Carbon Film 24k 1/5W	C	
R001	3069335970	Carbon Film 3.3M 1/5W	C	
R002	3069335970	Carbon Film 3.3M 1/5W	C	
R101	3039339472	Metal Oxide 3.3 1W	D	
R102	3039339472	Metal Oxide 3.3 1W	D	
R103	3069432970	Carbon Film 4.3k 1/5W	D	
R104	3069432970	Carbon Film 4.3k 1/5W	D	
R105	3039100472	Metal Oxide 10 1W	D	
R106	3039100472	Metal Oxide 10 1W	D	
R110	3069103970	Carbon Film 10k 1/5W	D	
R111	3069103970	Carbon Film 10k 1/5W	D	
R112	3069103970	Carbon Film 10k 1/5W	D	
R300L/R	3069273970	Carbon Film 27k 1/5W	C	
R301L/R	3069123970	Carbon Film 12k 1/5W	C	
R303L/R	3069471970	Carbon Film 470 1/5W	C	
R304L/R	3069560970	Carbon Film 100k 1/5W	C	
R305L/R	3069560970	Carbon Film 56 1/5W	C	
R306L/R	3069332970	Carbon Film 3.3k 1/5W	C	
R307L/R	3069152970	Carbon Film 1.5k 1/5W	C	
R308L/R	3069332970	Carbon Film 3.3k 1/5W	C	
R309L/R	3069103970	Carbon Film 10k 1/5W	C	
R310L/R	3069470970	Carbon Film 47 1/5W	C	
R311L/R	3069122970	Carbon Film 1.2k 1/5W	C	
R312L/R	3069122970	Carbon Film 1.2k 1/5W	C	
R315L/R	3069121970	Carbon Film 120 1/5W	C	
R316L/R	3069331970	Carbon Film 330 1/5W	C	
R317L/R	3069273970	Carbon Film 27k 1/5W	C	
R318L/R	3039222472	Metal Oxide 2.2k 1W	C	
R319L/R	3069472970	Carbon Film 4.7k 1/5W	C	
R322L/R	3039109472	Metal Oxide 1 1W	C	
R323L/R	3039471472	Metal Oxide 470 1W	C	
R324L/R	3069911970	Carbon Film 910 1/5W	C	
R326L/R	3069121970	Carbon Film 120 1/5W	C	
R327L/R	3069183970	Carbon Film 18k 1/5W	C	
R328L/R	3039109472	Metal Oxide 1 1W	C	
R329L/R	3069220970	Carbon Film 22 1/5W	C	
R330L/R	3069243970	Carbon Film 24k 1/5W	C	
R331L/R	3069104970	Carbon Film 100k 1/5W	C	
R332L/R	3059278782	Cement 0.27 5W	C, D	
R333L/R	3059278782	Cement 0.27 5W	C, D	
R334L/R	3069472970	Carbon Film 4.7k 1/5W	C	
R335L/R	3069153970	Carbon Film 15k 1/5W	C	
R336	3069223970	Carbon Film 22k 1/5W	C	
R337	3069223970	Carbon Film 22k 1/5W	C	
R338	3069102970	Carbon Film 1k 1/5W	C	
R339L/R	3069183970	Carbon Film 18k 1/5W	C	
R340	3069182970	Carbon Film 1.8k 1/5W	C	
R341	3069470970	Carbon Film 47 1/5W	C	
R342	3069223970	Carbon Film 22k 1/5W	C	
R343	3039100472	Metal Oxide 10 1W	C	
R360L/R	3069273970	Carbon Film 27k 1/5W	C	
• Transistors				
Q101	2008609101	MPSA 05	D	
Q102	2208606104	KTC 1815	D	

## INPUT BOARD 4002118020

Ref. No	Parts No.	Description	Position	Remark
Q103	2008209101	MPSA 55	C	
Q301L/R	2008610102	2SD 1302	C	
Q302L/R	2018217700	2SK332F, FET	C	
Q303L/R	2208606108	KTC 2240BL	C	
Q304L/R	2208606108	KTC 2240BL	C	
Q305L/R	2008207101	2SA 1360Y	C	
Q306L/R	2008609101	MPSA 05	C	
Q310L/R	2008609107	MPS 9633	C	
Q311L/R	2028407118	2SC 2168	C	
Q312L/R	2008607106	2SC 3423	C	
Q313L/R	2008107115	2SA 958	C	
Q314L/R	2028416110	2SC 3856	C	
Q315L/R	2028116107	2SA 1492	C	
Q316L/R	2008609101	MPSA 05	C	
Q317	2008209101	MPSA 55	C	
Q318	2008609101	MPSA 05	C	
Q319	2008609101	MPSA 05	C	
Q320	2008609101	MPSA 05	C	

## VOLUME BOARD 4002118030

Ref. No	Parts No.	Description	Position	Remark
• Capacitors				
C702L/R	3679393120	Mylar 0.039μF 100V	E2	
C704L/R	3479247971	Electric 4.7μF 50V	E2	
C705L/R	3479247971	Electric 4.7μF 50V	E2	
C708L/R	3479247971	Electric 4.7μF 50V	E2	
C711	3479247061	Electric 47μF 35V	E2	
C712	3479210071	Electric 10μF 50V	E2	
• Resistors				
R702L/R	3069622970	Carbon Film 6.2k 1/5W	E2	
R704L/R	3069105970	Carbon Film 1M 1/5W	E2	
R705L/R	3069471970	Carbon Film 470Ω 1/5W	E2	
R706L/R	3069202970	Carbon Film 2k 1/5W	E2	
R707L/R	3069102970	Carbon Film 1k 1/5W	E2	
R708L/R	3069103970	Carbon Film 10k 1/5W	E2	
R709L/R	3069154970	Carbon Film 150k 1/5W	E2	
R713	3069473970	Carbon Film 47k 1/5W	E2	
R714	3069103970	Carbon Film 10k 1/5W	E2	
• Transistors				
Q702L/R	2018207106	FET 2SK 117	E2	
Q703L/R	2008610102	2SD 1302	E2	

## SPEAKER BOARD 4002117900

Ref. No	Parts No.	Description	Position	Remark
• Capacitors				
C901L/R	3679473120	Mylar 0.047μF 100V	G	
C905L/R	3579561130	Ceramic 560pF 50V	G	D
• Coil				
L901L/R	2648001010	Inductor 0.5μH	G	
• Resistors				
R901L/R	3069100970	Carbon Film 10Ω	G	
R902L/R	3069220970	Carbon Film 22Ω	G	
R903L/R	3069220970	Carbon Film 22Ω	G	
R904L/R	3069471572	Carbon Film 470Ω	G	
R905L/R	3069152970	Carbon Film 1.5k	G	D

Ref. No	Parts No.	Description	Position	Remark
• Capacitors				
C200	3579473530	Ceramic 0.047μF 50V	E3	
C201L/R	3579680130	Ceramic 68pF 50V	E3	D
C202L/R	3579220130	Ceramic 22pF 50V	E3	D
C203L/R	3579680130	Ceramic 68pF 50V	E3	
C204L/R	3479247971	Electric 4.7μF 50V	E3	
C205L/R	3579100130	Ceramic 10pF 50V	E3	
C206L/R	3479247021	Electric 47μF 10V	E3	
C207L/R	3579222130	Ceramic 2200pF 50V	E3	
C208L/R	3679183120	Mylar 0.018μF 100V	E3	
C209L/R	3679563120	Mylar 0.056μF 100V	E3	
C210L/R	3479268871	Electric 0.68μF 50V	E3	
C211L/R	3679563120	Mylar 0.056μF 100V	E3	
C212L/R	3579101130	Ceramic 100pF 50V	E3	D
C213L/R	3579101130	Ceramic 100pF 50V	E3	D
C214L/R	3579101130	Ceramic 100pF 50V	E3	D
C215L/R	3579101130	Ceramic 100pF 50V	E3	D
C216L/R	3579101130	Ceramic 100pF 50V	E3	D
C217L/R	3579101130	Ceramic 100pF 50V	E3/F3	D
C218L/R	3579101130	Ceramic 100pF 50V	F3	D
C219L/R	3579101130	Ceramic 100pF 50V	F3	D
C220L/R	3579101130	Ceramic 100pF 50V	F3	D
C221L/R	3579101130	Ceramic 100pF 50V	F3	D
C222L/R	3579101130	Ceramic 100pF 50V	F3	D
C223L/R	3579101130	Ceramic 100pF 50V	F3	D
C224L/R	3579101130	Ceramic 100pF 50V	F3	D
C225L/R	3579101130	Ceramic 100pF 50V	F3	D
C226L/R	3579101130	Ceramic 100pF 50V	F3	D
C227L/R	3579101130	Ceramic 100pF 50V	F3	D
C228L/R	3479247041	Electric 47μF 25V	F3	
C229L/R	3579101130	Ceramic 100pF 50V	F3	
C230L/R	3479247971	Electric 4.7μF 50V	F3	
C240	3479247041	Electric 47μF 25V	F3	
C241	3479247041	Electric 47μF 25V	F3	
C242	3479247041	Electric 47μF 25V	F3	
C243	3479247041	Electric 47μF 25V	F3	
C244	3479247041	Electric 47μF 25V	F3	
C245	3479247041	Electric 47μF 25V	F3	
C500	3579101130	Ceramic 100pF 50V	F3	
C501	3579101130	Ceramic 100pF 50V	F3	
C502	3579101130	Ceramic 100pF 50V	F3	
C503	3479210871	Electric 0.1μF 50V	F3	
• Coil				
L201L/R	2648001010	0.5μH	E3	D
• Diode				
D503	2258306101	1N 4148	F3	
• ICs				
IC201	2168020106	NJM 2168DD ,OP Amp	E3	
IC202	2168017132	LC7821, Switching	F3	
IC203	2138017108	LC4966, Switching	F3	
IC204	2168220104	NJM 4560D ,OP Amp	F3	
• Resistors				
R201L/R	3069102970	Carbon Film 1k 1/5W	E3	
R202L/R	3069913970	Carbon Film 91k 1/5W	E3	
R203L/R	3069913970	Carbon Film 91k 1/5W	E3	
R204L/R	3069911970	Carbon Film 910 1/5W	E3	
R205L/R	3069433970	Carbon Film 43k 1/5W	E3	
R206L/R	3069563970	Carbon Film 560k 1/5W	E3	
R207L/R	3069471970	Carbon Film 470 1/5W	E3	
R208L/R	3069104970	Carbon Film 100k 1/5W	E3	
R209L/R	3069121970	Carbon Film 120 1/5W	E3	D
R210L/R	3069102970	Carbon Film 1k 1/5W	E3	
R211L/R	3069473970	Carbon Film 47k 1/5W	E3	
R212L/R	3069121970	Carbon Film 120 1/5W	E3	D
R213L/R	3069102970	Carbon Film 1k 1/5W	E3	
R214L/R	3069473970	Carbon Film 47k 1/5W	E3	

## FRONT-A BOARD 4002118000

Ref. No	Parts No.	Description	Position	Remark
R215L/R	3069121970	Carbon Film 120 1/5W	E3	D
R216L/R	3069102970	Carbon Film 1k 1/5W	E3	
R217L/R	3069473970	Carbon Film 47k 1/5W	E3, F3	D
R218L/R	3069121970	Carbon Film 120 1/5W	F3	
R219L/R	3069102970	Carbon Film 1k 1/5W	F3	
R220L/R	3069473970	Carbon Film 47k 1/5W	F3	
R221L/R	3069102970	Carbon Film 1k 1/5W	F3	
R222L/R	3069121970	Carbon Film 120 1/5W	F3	D
R223L/R	3069102970	Carbon Film 1k 1/5W	F3	
R224L/R	3069473970	Carbon Film 47k 1/5W	F3	
R225L/R	3069102970	Carbon Film 1k 1/5W	F3	
R226L/R	3069121970	Carbon Film 120 1/5W	F3	
R227L/R	3069102970	Carbon Film 1k 1/5W	F3	
R228L/R	3069473970	Carbon Film 47k 1/5W	F3	
R229L/R	3069104970	Carbon Film 100k 1/5W	F3	
R230L/R	3069104970	Carbon Film 100k 1/5W	F3	
R231L/R	3069471970	Carbon Film 470 1/5W	F3	
R240	3069470970	Carbon Film 47 1/5W	F3	
R241	3069470970	Carbon Film 47 1/5W	F3	
R242	3069101970	Carbon Film 100 1/5W	F3	
R243	3069101970	Carbon Film 100 1/5W	F3	
R244	3069101970	Carbon Film 100 1/5W	F3	
R245	3069101970	Carbon Film 100 1/5W	F3	
R503	3069104970	Carbon Film 100k 1/5W	F3	

## TONE BOARD 4002118050

Ref. No	Parts No.	Description	Position	Remark
• Capacitors				
C601L/R	3679153120	Mylar 0.015μF 100V	E1	
C602L/R	3679683120	Mylar 0.068μF 100V	E1	
C603L/R	3409222032	Electric 22μF 50V	E1	
C604L/R	3679332120	Mylar 0.0033μF 100V	E1	
C605L/R	3679153120	Mylar 0.015μF 100V	E1	
C606L/R	3579150130	Ceramic 15pF 50V	E1	
C620L/R	3658224201	Tantal 0.22μF	F1	
C621L/R	3658224201	Tantal 0.22μF	F1	
• Resistors				
R601L/R	3069224970	Carbon Film 220k	E1	
R602L/R	3069223970	Carbon Film 22k	E1	
R603L/R	3069392970	Carbon Film 3.9k	E1	
R605L/R	3069242970	Carbon Film 2.4k	E1	
R606L/R	3069184970	Carbon Film 180k	E1	
R607L/R	3069821970	Carbon Film 820Ω	E1	
R608L/R	3069473970	Carbon Film 47k	E1	
R609L/R	3069302970	Carbon Film 3k	E1	
R610L/R	3069471970	Carbon Film 470Ω	F1	
R620L/R	3069473970	Carbon Film 47k	F1	
R621L/R	3069753970	Carbon Film 75k	F1	

Ref. No	Parts No.	Description	Position	Remark
• Capacitors				
C420	3439110412	Electric 0.1F 50V	B1	
C422	3579330530	Ceramic 33pF 50V	A1	
C423	3579330530	Ceramic 33pF 50V	A1	
C424	3479210071	Electric 10μF 50V	B1	
C450	3579104130	Ceramic 0.01μF 50V	A1	
X-TAL	3908101150	X-TAL 6 MHz		
• Diode				
D420	2258306101	1N 4148	B1	
• ICs				
IC403	2138000148	MB 88543, Microprocessor	B1	
IC404	2138000129	SBX 1483	A1	
• LEDs				
LD401	2308220507	SLV56 DC3	A1	
LD402	2308220507	SLV56 DC3	A1	
LD403	2308220507	SLV56 DC3	B1	
LD404	2308220507	SLV56 DC3	B1	
LD405	2308220507	SLV56 DC3	B1	
LD406	2308220507	SLV56 DC3	B1	
LD407L/R	2318271003	Display	A1/B1	
LCD	2338009921	8024 MJP	A1	
• Resistors				
R450	3069222970	Carbon Film 2.2k 1/5W	B1	
R452	3069243970	Carbon Film 24k 1/5W	B1	
R453	3069223970	Carbon Film 22k 1/5W	B1	
R454	3069103970	Carbon Film 10k 1/5W	B1	
R455	3069102970	Carbon Film 1k 1/5W	B1	
R456	3069102970	Carbon Film 1k 1/5W	B1	
R457	3069473970	Carbon Film 47k 1/5W	A1	
R458	3069473970	Carbon Film 47k 1/5W	A1	
R459	3069473970	Carbon Film 47k 1/5W	A1	
R460	3069472970	Carbon Film 4.7k 1/5W	A1	
R461	3069472970	Carbon Film 4.7k 1/5W	A1	
R463	3069104970	Carbon Film 100k 1/5W	A1	
R464	3069332970	Carbon Film 3.3k 1/5W	A1	
R465	3069680970	Carbon Film 68 1/5W	A1	
R466	3069104970	Carbon Film 100k 1/5W	A1	
R467	3069103970	Carbon Film 10k 1/5W	A1	
R468	3069104970	Carbon Film 100k 1/5W	A1	
R469	3069473970	Carbon Film 47k 1/5W	A1	
R495	3069103970	Carbon Film 10k 1/5W	A1	
R496	3069103970	Carbon Film 10k 1/5W	A1	
R497	3069103970	Carbon Film 10k 1/5W	A1	
R499	3069103970	Carbon Film 10k 1/5W	A1	
• Transistors				
Q450	2208606104	KTC 1815	B1	
Q451	2208606104	KTC 1815	A1	
Q452	2208606104	KTC 1815	A1	



## FRONT-B BOARD 4002118010

Ref. No	Parts No.	Description	Position	Remark
<b>• Capacitors</b>				
C401	3409247131	Electric 470 $\mu$ F 16V	B2	
C402	3409247131	Electric 470 $\mu$ F 16V	B2	
C403	3579473530	Ceramic 0.047 $\mu$ F 50V	B2	
C404	3479233061	Electric 33 $\mu$ F 35V	B2	
C405	3479247031	Electric 47 $\mu$ F 16V	A2	
C408L/R	3479247971	Electric 4.7 $\mu$ F 50V	A2	
C410	3479210971	Electric 1 $\mu$ F 50V	B2	
<b>• Diodes</b>				
D401	2058599113	DZ 24BM	B2	
D402	2258306101	1N4148	B2	
D403	2258306101	1N4148	B2	
D404	2058599104	DZ5.6BM	B2	
D405	2058599104	DZ5.6BM	B2	
D406	2258306101	1N4148	A2	
D408	2258306101	1N4148	B2	
D409	2258306101	1N4148	A2	
D445	2258306101	1N4148	B2	
D470L/R	2258306101	1N4148	A2	
<b>• ICs</b>				
IC401	2168000113	LM324, OP Amp	A2	
IC402	2138001118	SN74MC 138, Decoder	A2	
<b>• Resistors</b>				
R401	3069223970	Carbon Film 22k 1/5W	B2	
R402	3069223970	Carbon Film 22k 1/5W	B2	
R403	3069103970	Carbon Film 10k 1/5W	B2	
R404	3069222970	Carbon Film 2.2k 1/5W	B2	
R405	3069104970	Carbon Film 100k 1/5W	B2	
R406	3069224970	Carbon Film 220k 1/5W	B2	
R407	3069103970	Carbon Film 10k 1/5W	B2	
R408	3069473970	Carbon Film 47k 1/5W	B2	
R409	3069102970	Carbon Film 1k 1/5W	B2	
R410	3069102970	Carbon Film 1k 1/5W	B2	
R411	3069103970	Carbon Film 10k 1/5W	B2	
R412	3069103970	Carbon Film 10k 1/5W	B2	
R413	3069222970	Carbon Film 2.2k 1/5W	B2	
R414	3069222970	Carbon Film 2.2k 1/5W	B2	
R415	3069222970	Carbon Film 2.2k 1/5W	B2	
R416	3069222970	Carbon Film 2.2k 1/5W	B2	
R417	3069472970	Carbon Film 4.7k 1/5W	B2	
R418	3069103970	Carbon Film 10k 1/5W	B2	
R419	3069103970	Carbon Film 10k 1/5W	B2	
R420	3069104970	Carbon Film 100k 1/5W	B2	
R421	3069513970	Carbon Film 51k 1/5W	B2	
R422	3069473970	Carbon Film 47k 1/5W	B2	
R423	3069102970	Carbon Film 1k 1/5W	B2	
R424	3069103970	Carbon Film 10k 1/5W	B2	
R425	3069122970	Carbon Film 1.2k 1/5W	A2	
R426	3069122970	Carbon Film 1.2k 1/5W	A2	
R427	3069122970	Carbon Film 1.2k 1/5W	A2	
R428	3069103970	Carbon Film 10k 1/5W	A2	
R429	3069103970	Carbon Film 10k 1/5W	A2	
R430	3069103970	Carbon Film 10k 1/5W	A2	
R431	3069472970	Carbon Film 4.7k 1/5W	A2	
R432	3069472970	Carbon Film 4.7k 1/5W	A2	
R433	3069122970	Carbon Film 1.2k 1/5W	A2	
R434	3069122970	Carbon Film 1.2k 1/5W	A2	
R435	3069122970	Carbon Film 1.2k 1/5W	A2	
R436	3069122970	Carbon Film 1.2k 1/5W	A2	
R437	3069122970	Carbon Film 1.2k 1/5W	A2	
R438	3069122970	Carbon Film 1.2k 1/5W	A2	
R444	3069222970	Carbon Film 2.2k 1/5W	B2	
R460	3069155970	Carbon Film 1.5M 1/5W	B2	
R480L/R	3069273970	Carbon Film 27k 1/5W	A2	
R481L/R	3069104970	Carbon Film 100k 1/5W	A2	
R482L/R	3069153970	Carbon Film 15k 1/5W	A2	
R483L/R	3069224970	Carbon Film 220k 1/5W	A2	
R484L/R	3069681970	Carbon Film 680 $\Omega$ 1/5W	A2	

Ref. No	Parts No.	Description	Position	Remark
R485	3069473970	Carbon Film 47k 1/5W	A2	
R486L/R	3069683970	Carbon Film 68k 1/5W	A2	
R487L/R	3069102970	Carbon Film 1k 1/5W	A2	
R489L/R	3069122970	Carbon Film 1.2k 1/5W	A2	
R490	3069102970	Carbon Film 1kN1/5W	A2	
R491	3039680472	Metal Oxide 68 $\Omega$ 1W	B2	
R00	3069104970	Carbon Film 100k 1/5W	A2	
RADDER R1	3088103273	Carbon Film 10k 1/5W	B2	
RADDER R1	3088103273	Carbon Film 10k 1/5W	B2	
<b>• Transistors</b>				
Q401	2208606104	KTC1815	B2	
Q402	2208606104	KTC1815	B2	
Q403	2208606104	KTC1815	B2	
Q404	2208606104	KTC1815	B2	
Q405	2208606104	KTC1815	B2	
Q406	2008610102	2SD1302	B2	
Q407	2008610102	2SD1302	B2	
Q408	2008209101	MPS A55	B2	
Q409	2008209101	MPS A55	B2	
Q410	2208606104	KTC1815	B2	
Q411	2208606105	KTC1015	B2	
Q412	2208606104	KTC1815	B2	
Q413	2008610102	2SD1302	B2	
Q414	2008209101	MPS A55	B2	
Q415	2208606104	KTC1815	A2	
Q416	2208606104	KTC1815	A2	
Q417	2208606104	KTC1815	A2	
Q418	2208606104	KTC1815	A2	
Q480L/R	2208606104	KTC1815	A2	

## BIASING BOARD 4002117920

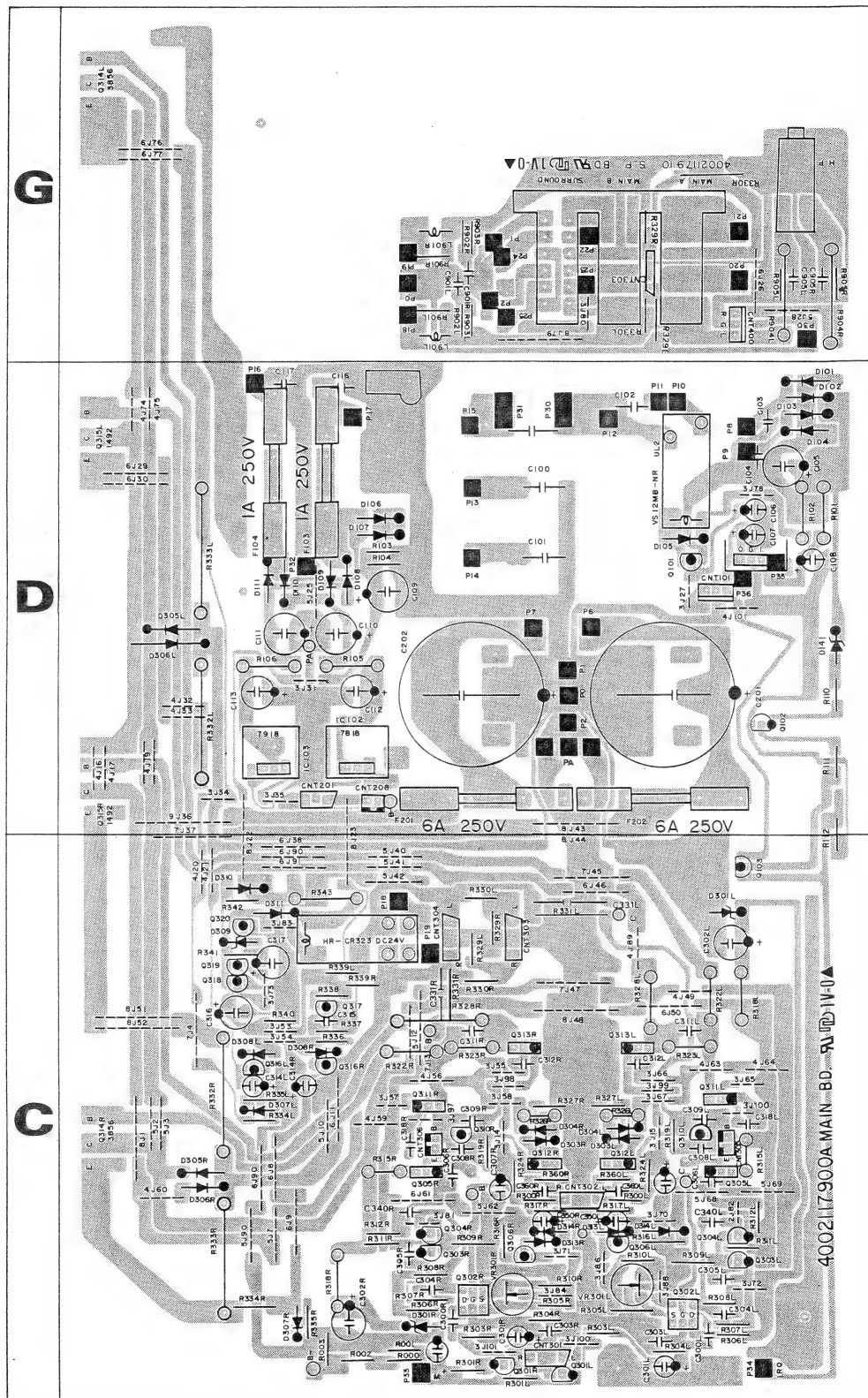
Ref. No	Parts No.	Description	Position	Remark
• Transistors				
Q307L/R	2008610102	2SD1302	F2	
Q308L/R	2008610102	2SD1302	F2	
Q309L/R	2008610102	2SD1302	F2	

## COMMANDER BOARD 40051129001

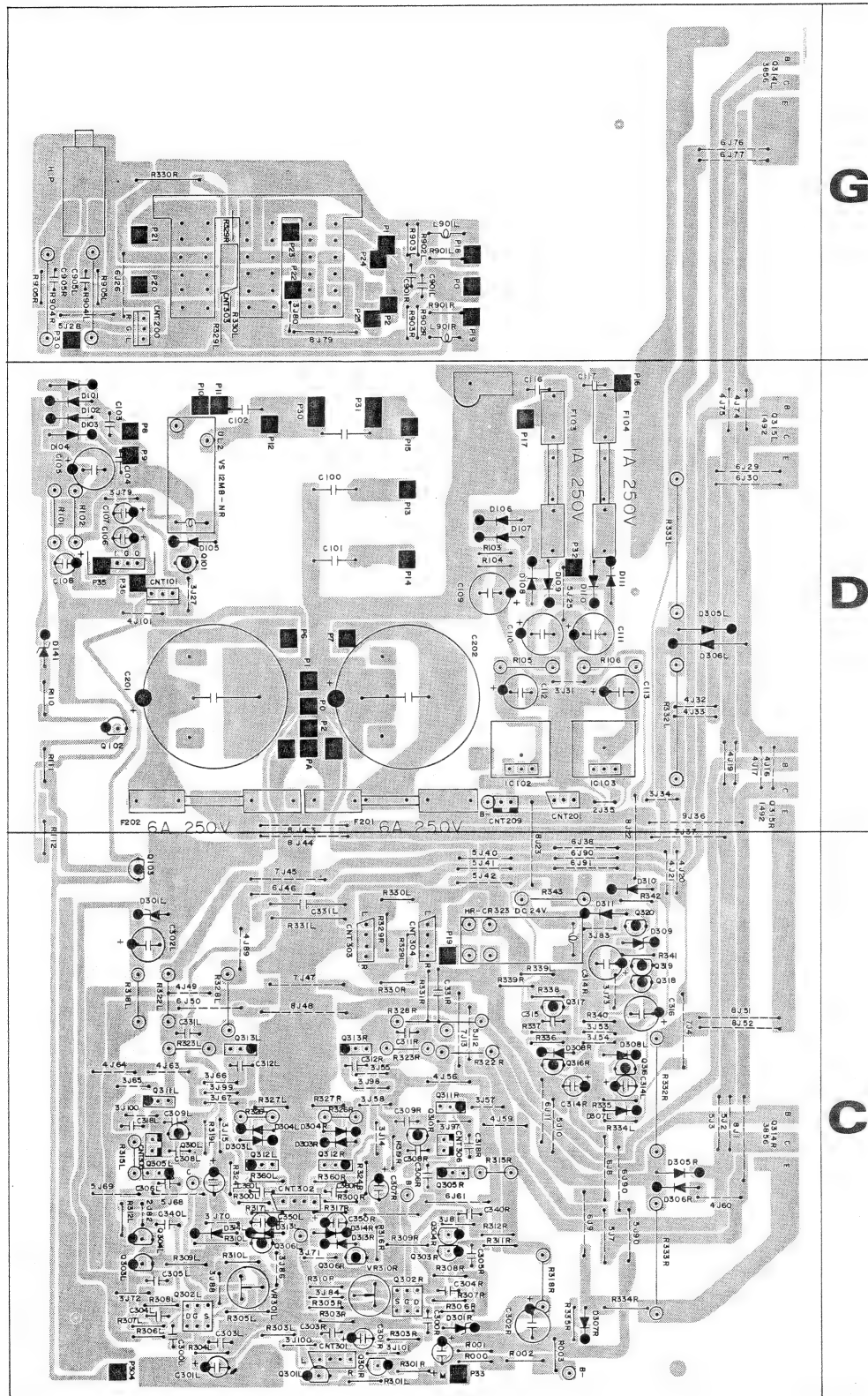
Ref. No	Parts No.	Description	Position	Remark
• Capacitors				
C1	34092247022	Electric AFSS 47 $\mu$ F 10V		
C2	3509101130	Ceramic 100PF 50V		
C3	3509101130	Ceramic 100PF 50V		
X-TAL	3938001001	Ceramic Resonator 455E		
• Diodes				
D1	2308060105	LED KLR 226 ER-0		
D2	2408001100	LED IREL-11Z		
• IC				
	2138013122	$\mu$ PD 6122G-002		
• Resistors				
R1	3069224970	Ceramic 220K 1/5W		
R2	3069224970	Ceramic 220K 1/5W		
R3	3069224970	Ceramic 220K 1/5W		
R4	3069229970	Ceramic 2.2 1/5W		
R5	3069102970	Ceramic 1k 1/5W		
• Miscellaneous Prats				
• Diode				
△	2058100118	Rectifier KBPC 25-04		
• Power Transformers				
• Main Transformers				
△	2828058207	Main Power Transformers	A	
△	2828058307	Main Power Transformers	B	
△	2828058407	Main Power Transformers	C,D,F	
△	2828058507	Main Power Transformers	E	
• Stand-by Transformers				
△	2828062707	Stand-by Transformers	A	
△	2828062507	Stand-by Transformers		B, Domestic
△	2828061507	Stand-by Transformers		C,D,E,F
• Fuses				
△	F001	5508213133 6A 250V AC, 31.8mm	Rear	A,B
△		5508302934 4A 250V AC, 20mm	Panel	C, D, E, F
△		5508213130 6A 250V AC, 31.8mm		Domestic
△	F002	5508111231 SB, 0.25A 250V AC, 31.8mm	Rear	A, B
△		5508301134 200mA 250V AC, 20mm	Panel	C, D, E, F
△	F003	5508212931 4A 250V AC, 31.8mm	Rear	B
△		5508212930 4A 250V AC, 31.8mm	Panel	Domestic
△	F004	5508110931 0.15A 250V AC, 31.8mm	Rear	B
△		5508110930 SB, 0.15A 250V AC, 31.8mm	Panel	Domestic

# Top & Bottom View of P.C Boards

MAIN BOARD 4002117900A - TOP VIEW

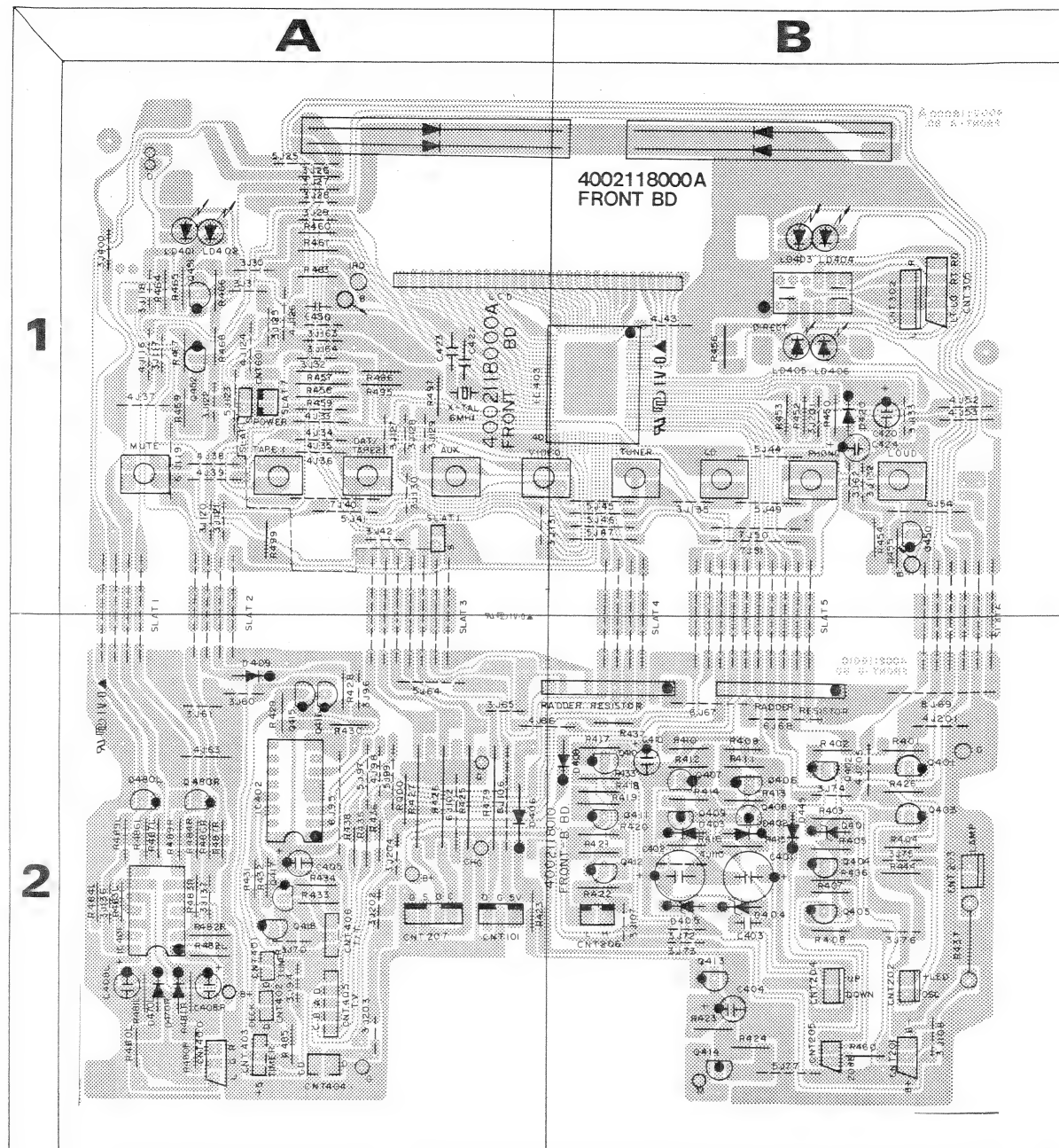


- BOTTOM VIEW



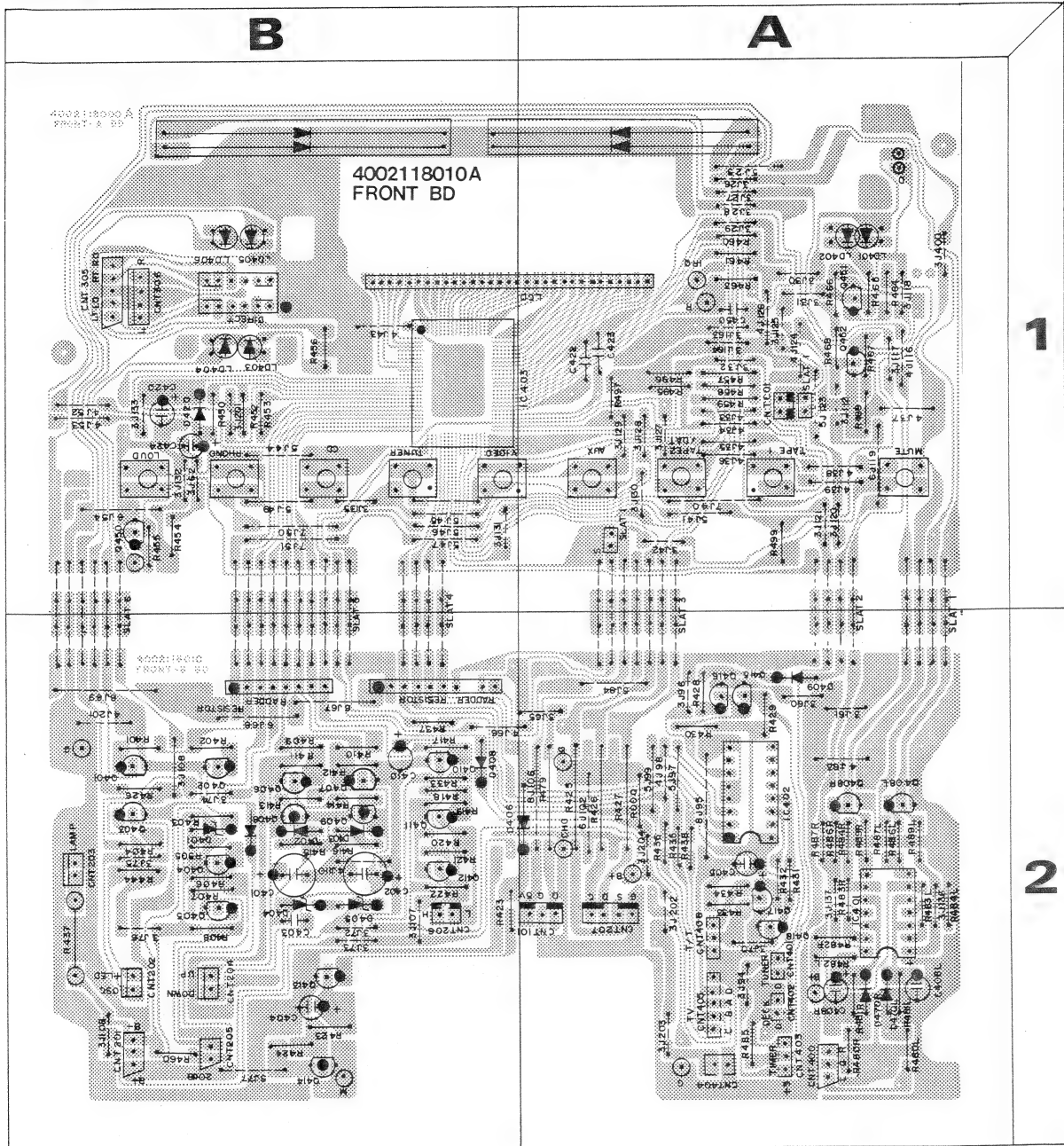
# FRONT BOARD 400211800A, 4002118010B

- TOP VIEW



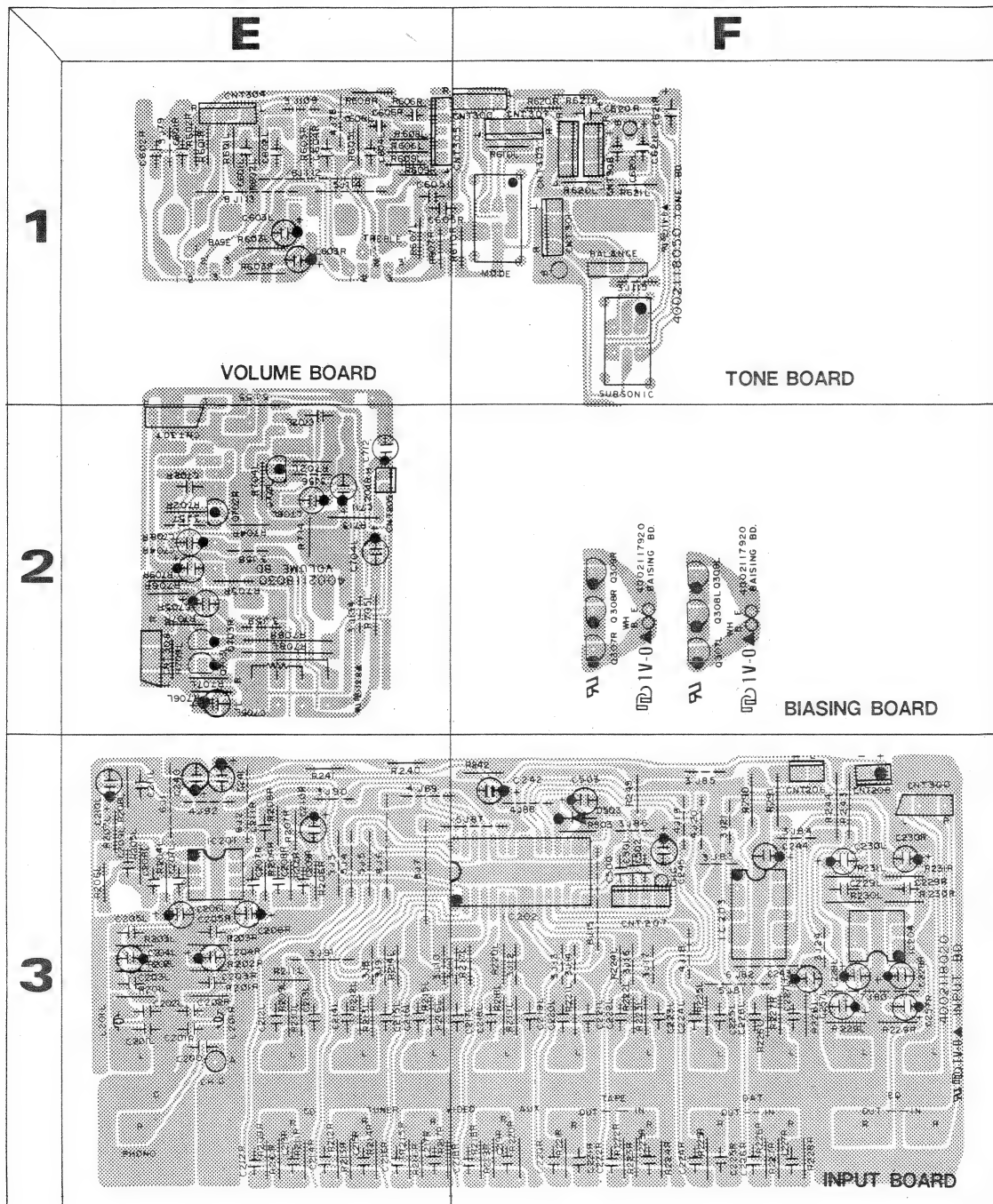


- BOTTOM VIEW

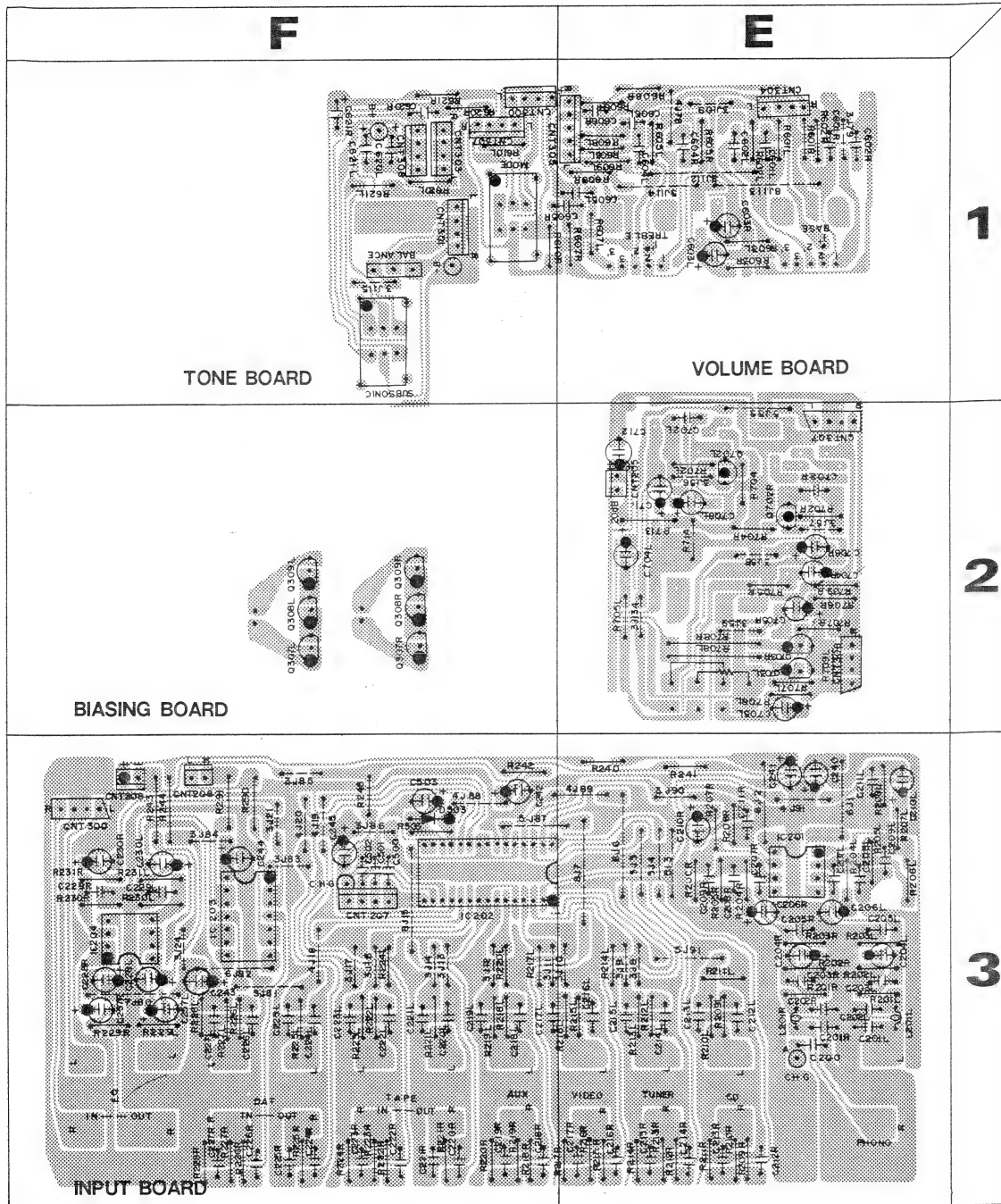


# INPUT, VOLUME, BIASING, TONE BOARD

- TOP VIEW

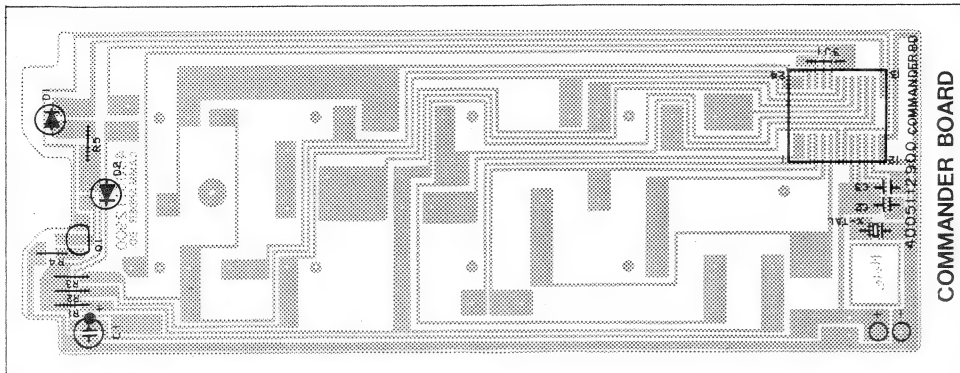


- BOTTOM VIEW

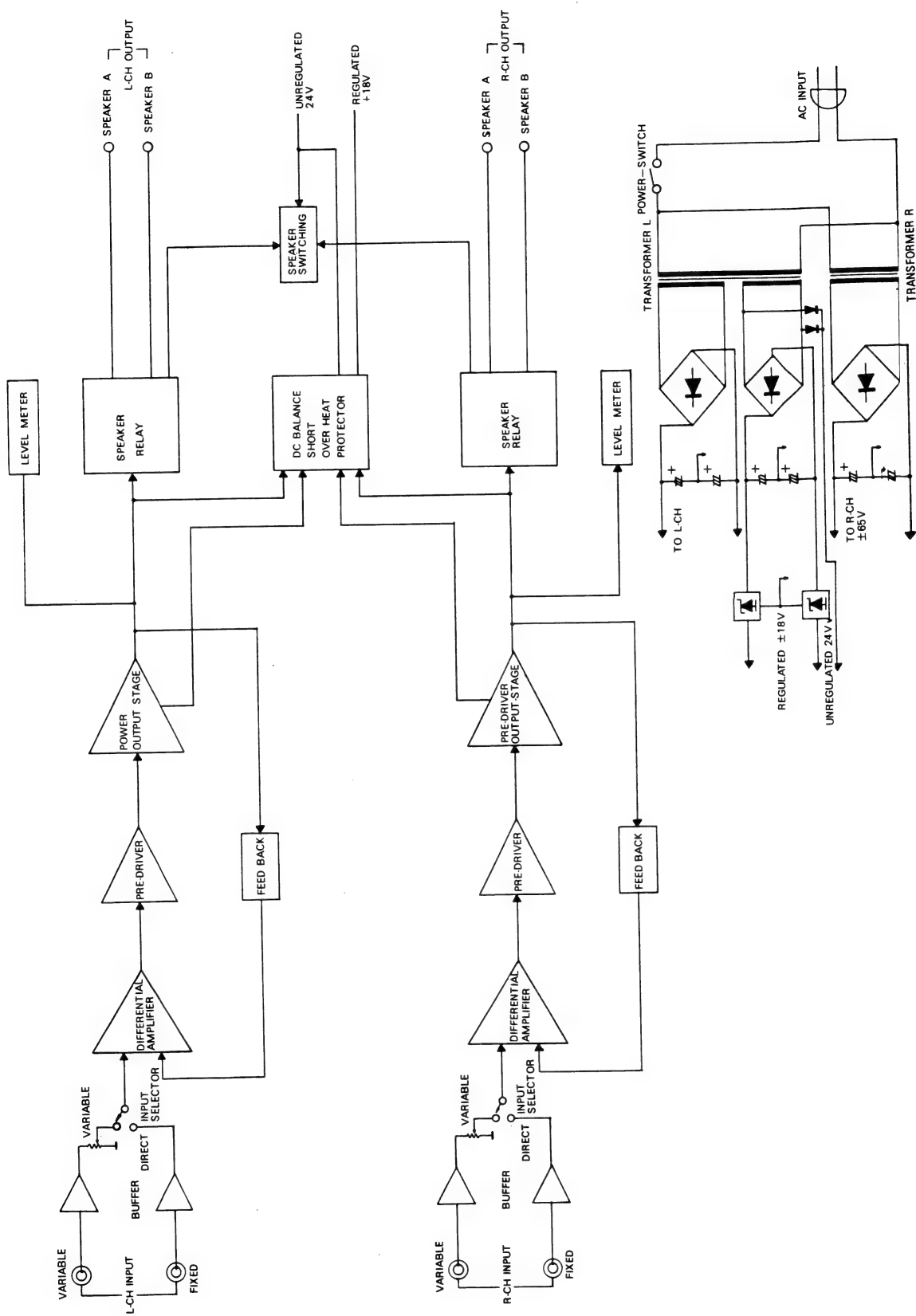




COMMANDER BOARD  
4005112900



# Block Diagram

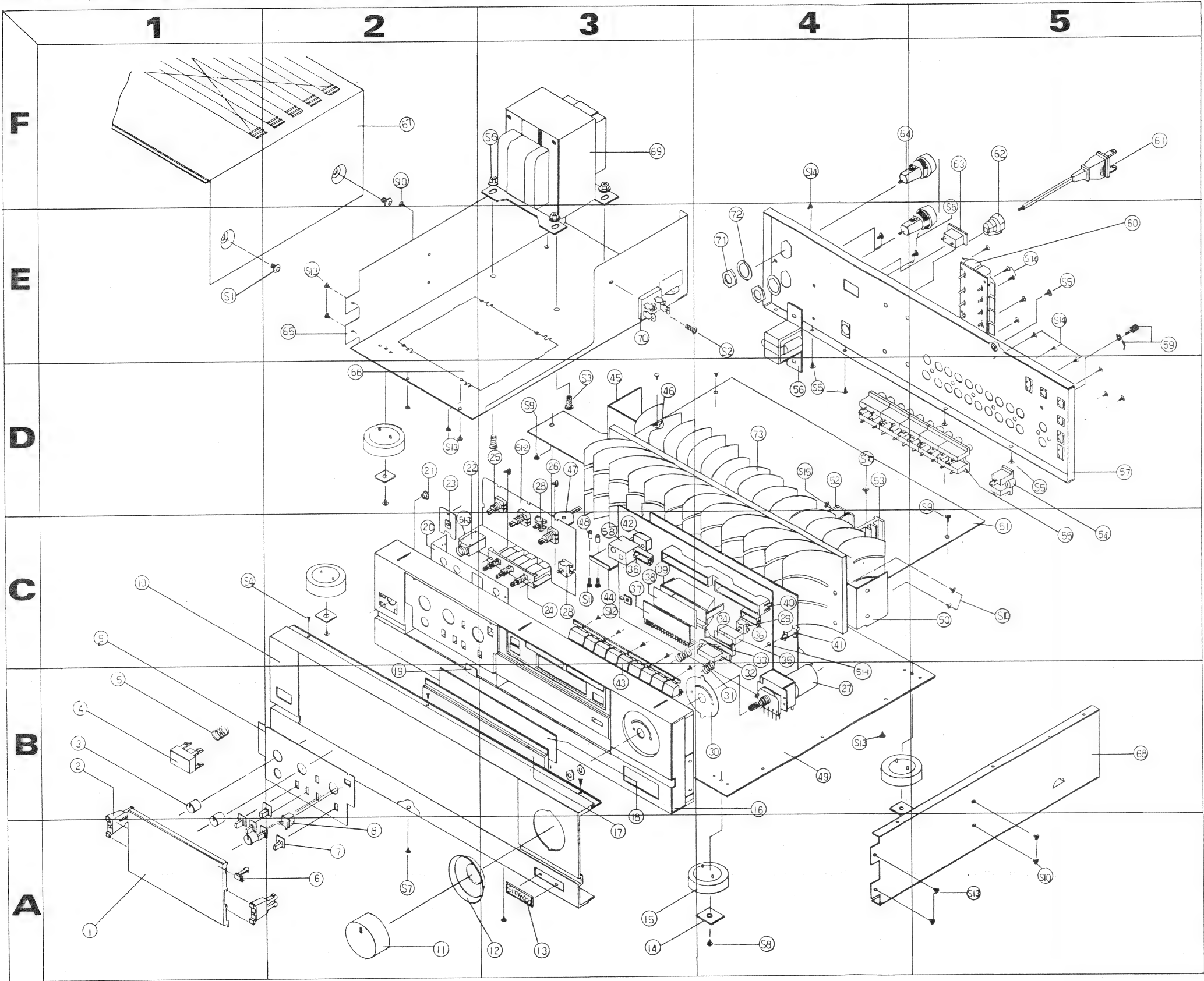


# Mechanical Parts List

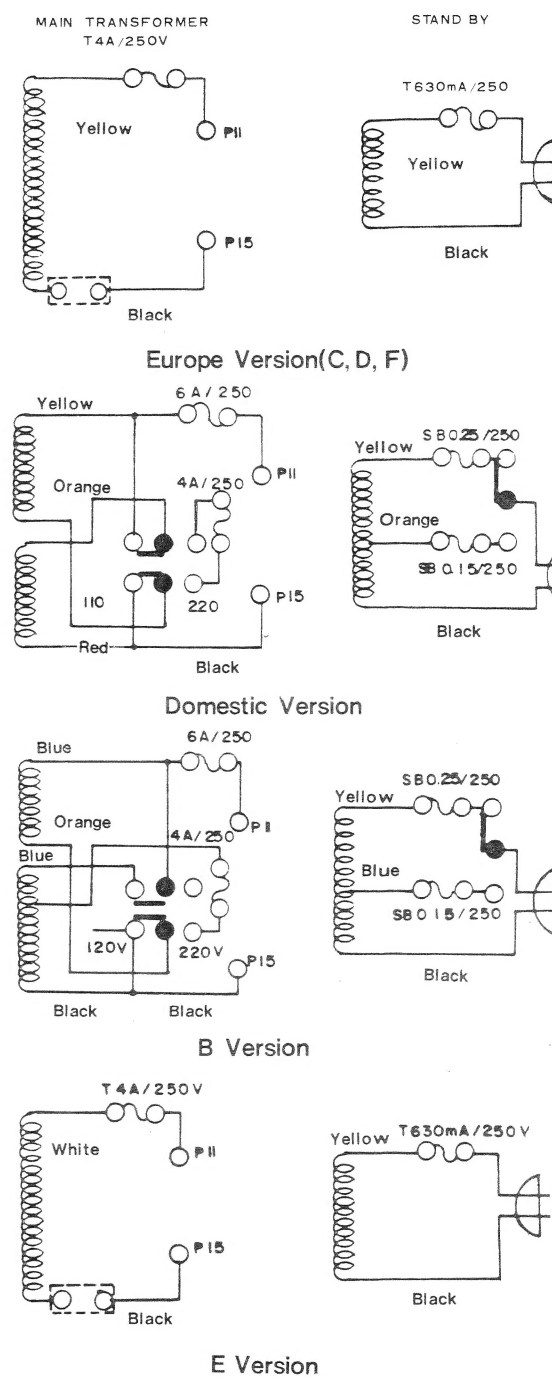
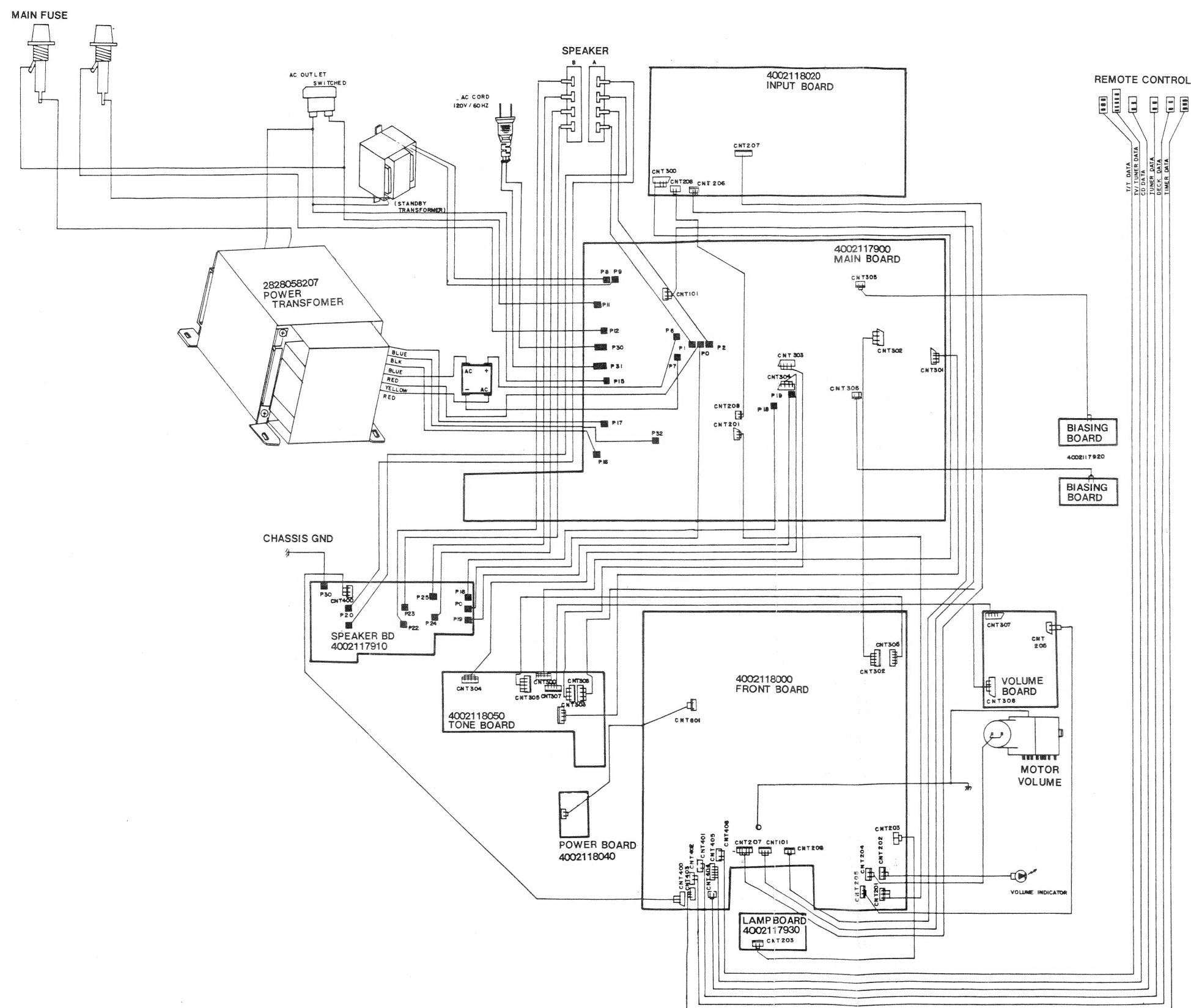
No.	Parts No.	Description	Q'ty	Position	Remark
1	048603000512	Door, Aluminium	1	A1	
2	6305004110	Door-Hinge	2	B1	
3	8545052210	Knob-Rotary,Control	3	B1	
4	048545048211	Knob-Power,Main	1	B1	
5	6555004340	Spring,Main Power	1	B1	
6	6305004610	Shaft-Locker	1	A2	
7	8545052110	Button,Push	5	A2	
8	7318000110	Door-Locker	1	A2	
9	8623005010	Plate Decoration	1	C1	
10	048602015811	Panel-Front,Black	1	C1	
11	8643003710	Knob-Rotary Main Volume	1	A2	
12	8523009210	Decorating Ring	1	A3	
13	048535019011	Badge	1	A3	
14	6725002110	Cushion-Foot,Black	4	A4	
15	046035101411	Foot-Base,Hot Stamping	4	A3	
16	048521004911	Body-Front	1	B4	
17	8553007910	Window LCD	1	B3	
18	8533005410	Display Inlay	1	A3	
19	8535021310	Filter-Sensor	1	B2	
20	6163105510	Shield-Fence (B)	1	C2	
21	6055003010	Insert-Tact	1	D2	
22	4438000810	Jack-Phone	1	D2	
23	4658002910	Switch-Tact	10	D2	
24	4628050010	Push-Switch, 3 Key	1	C3	
25	3208051110	Rotary-Volume, 100KC×2	2	D3	
26	3208051710	Rotary-Volume,250KSW	1	D3	
27	3208051610	Motor-Volume,100KA×2	1	B4	
28	4628050110	Push-Switch, 1Key	2	C3	
29	4628049810	Push-Switch, 1Key	1	C4	
30	6165128310	Shield-Fence (A)	1	B4	
31	6555006610	Spring, Direct	2	B4	
32	048545048411	Knob, Direct	1	B4	
33	6305003810	Shaft, Direct	1	C4	
34	8535020010	Diffuser	1	C4	
35	6165128210	Fence, LED	1	C4	
36	6045006610	Holder LED	2	C3	
37	2338009921	LCD	1	C3	
38	8535019710	Filter LCD	1	C3	
39	6042001410	Holder LCD	1	C3	
40	6043005710	Holder LED	1	C4	
41	6528300110	Fastner	4	C4	
42	2138000129	Sensor	1	C3	
43	048542000111	Button-Tact	1	B3	
44	6505081810	Bracket PCB	1	C3	
45	6505081720	Bracket-Heatsink,Left	1	D3	
46	4235003610	Terminal-Ground	1	D3	
47	2028416110	Transistor	2	C3	
	2028116107	Transistor	2	C3	
48	7015003110	Bushing	4	C3	
49	6122412210	Bottom-Cover	1	B4	
50	6505081710	Bracket-Heatsink,Right	1	C5	
51	4002117900	PCB-Main	1	C5	
51-1	4002118000	PCB-Front	2	B4	
51-2	4002118050	PCB-Tone	1	D3	
51-3	4002117910	PCB-Speaker	1	C3	
52	7505201930	Heatsink, Regulator TR	2	D4	
53	7505202410	Heatsink, Regulator TR	1	D4	
54	4438102210	RCA-JACK, 2P	1	C5	
55	4438102010	RCA-JACK, 4P	5	C5	
56	2828062707	Standby-Transformer	1	D4	
57	046102022721	Chassis-Back, Black	1	D5	A
	046102022731	Chassis-Back, Black	1	D5	B
	046102022741	Chassis-Back, Black	1	D5	C
	046102022751	Chassis-Back, Black	1	D5	D
	046102022761	Chassis-Back, Black	1	D5	E
	046102022771	Chassis-Back, Black	1	D5	F
58	6165130110	Sensor Box	1	C3	
59	4408103710	Terminal-Ground	1	E5	
60	4408100320	Terminal-Push	1	E5	
61	4308001410	Cord-Power, AC	1	F5	A, B
	4308002310	Cord-Power, AC	1	F5	C, D, F
	4308000610	Cord-Power, AC	1	F5	E

No.	Parts No.	Description	Q'ty	Position	Remark
62	6518000710	Cord-Stopper, Black	1	F5	A, B
	6518000111	Cord-Stopper, Black	1	F5	C, D, F
	6518000210	Cord-Stopper, Black	1	F5	E
63	4448102110	Outlet, AC	1	F5	A
	4448100320	Outlet, AC	1	F5	B
	4448100510	Outlet, AC	1	F5	C, D, F
64	4458000210	Fuse-Holder	2	F4	A, B
	4458000110	Fuse-Holder	2	F4	C, D, E, F
65	6121602710	Side-Frame, Left	1	E2	
66	6125401510	Button-Cover	1	D2	
67	6122017210	Cover-Top, Black	1	F2	
68	6122615910	Side-Frame, Right	1	B5	
69	2828058207	Power Transformer	1	F3	A
70	2058100118	Diode	1	F3	
71	.	Nut & Washer	1	E4	
72	.	Nut & Washer	1	E4	
73	7502001810	Heatsink, Power	1	D4	
S1	8159440083	Screw, WSAM 4×8 ZNB	4	E1	
S2	8159230161	Screw, #2 WPTC 3×16 ZNY	1	E4	
S3	8069140081	Screw, WPM 4×8 ZNY	4	D3	
S4	8129230081	Screw, #2 FTC 3×8 ZNY	3	C1	
S5	8119230063	Screw, #2 PTC 3×6 ZNB	10	E5	
S6	8209540011	Nut Flange M4 ZNY	4	F3	
S7	8109230083	Screw, #2 BTC 3×8 ZNB	3	A2	
S8	8159230081	Screw, 32 WPTC 3×8 ZNY	4	A4	
S9	8159230061	Screw, #2 WPTC 3×6 ZNY	8	D5	
S10	8109230081	Screw, #2 BTC 3×6 ZNY	21	F2	
S11	8099130161	HEX M3×16 ZNY	4	C3	
S12	8119126081	Screw, #1 PTC 2.6×8 ZNY	5	C3	
S13	8109230061	Screw, #2 BTC 3×6 ZNY	26	B4	
S14	8119230083	Screw, #2 PTC 3×8 ZNB	11	F4	
S15	8109330081	Screw, #3 BTC 3×8 ZNY	2	D4	

**Exploded View of Cabinet & Chassis**

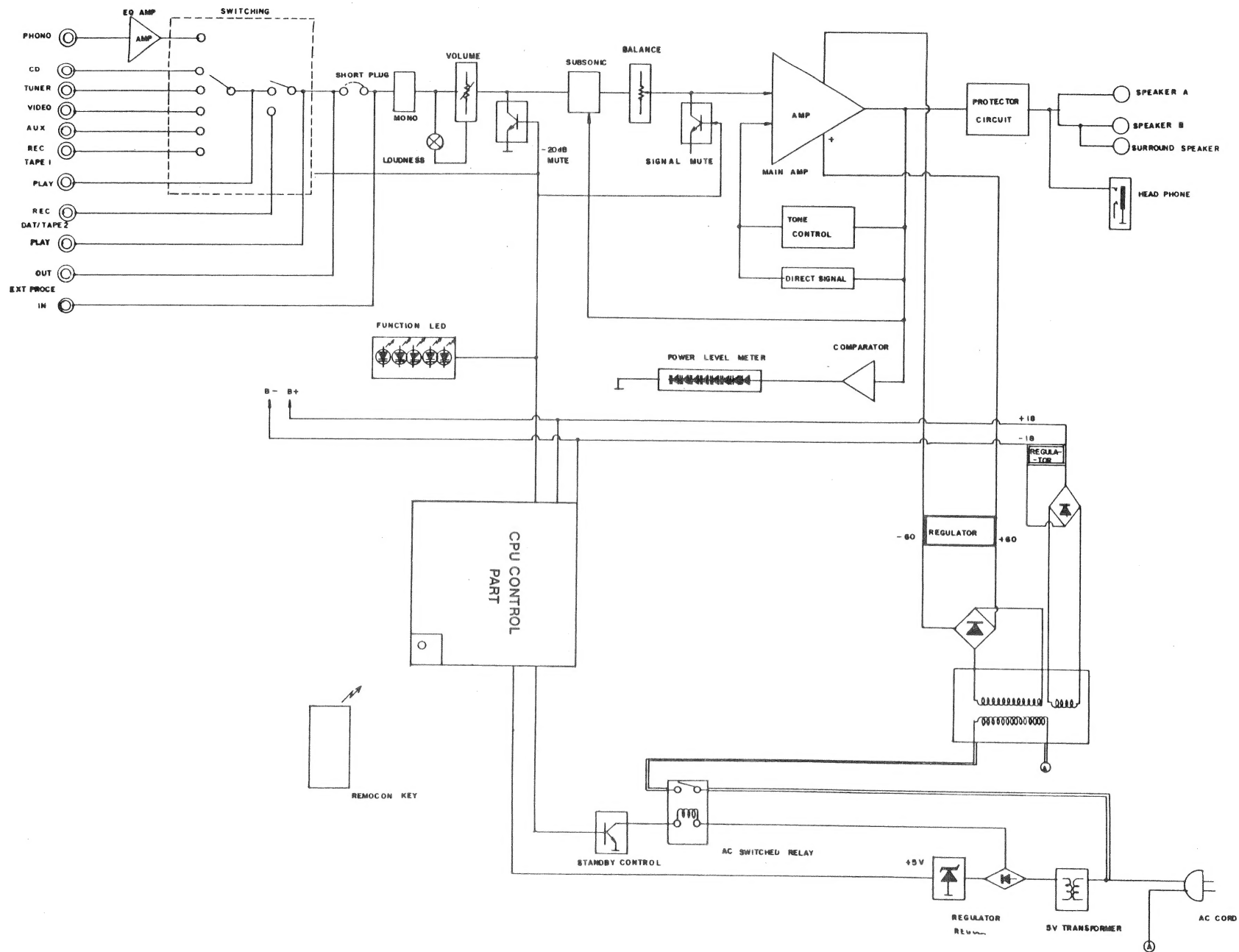


## Point to Point Wiring Diagram



VERSION	MAIN TRANS	STANBY TRANS
A	2828058207(I)	2828062707
B	2828058307(I)	2828062507
C, D, F	2828058407(I)	2828061507
E	2828058507(I)	2828061507
DOMESTIC	2828058607(I)	2828062507

# Block Diagram (AI-1210R ONLY)



A

B

C

D

## Schematic Diagram

AI-1210R

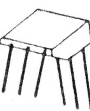
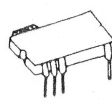
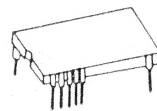
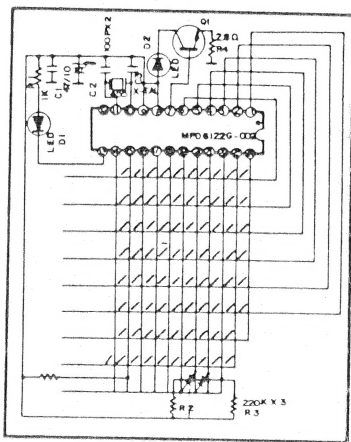
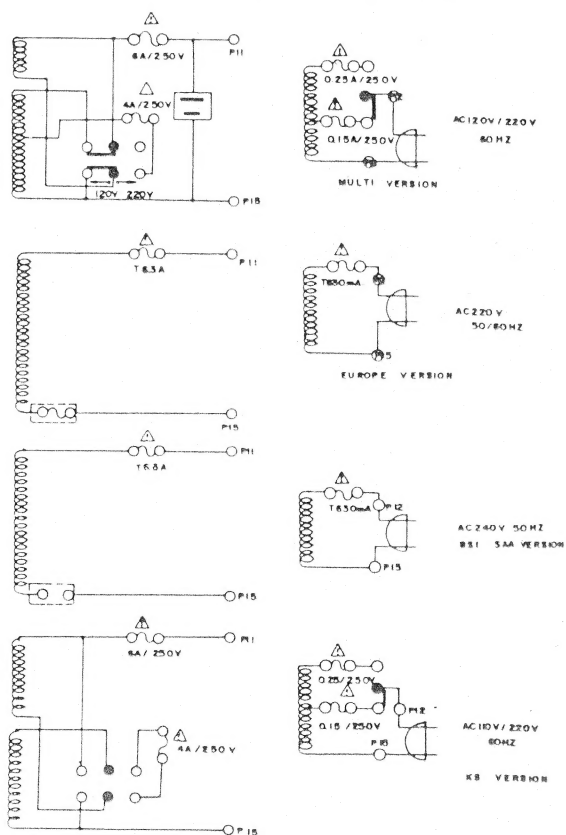
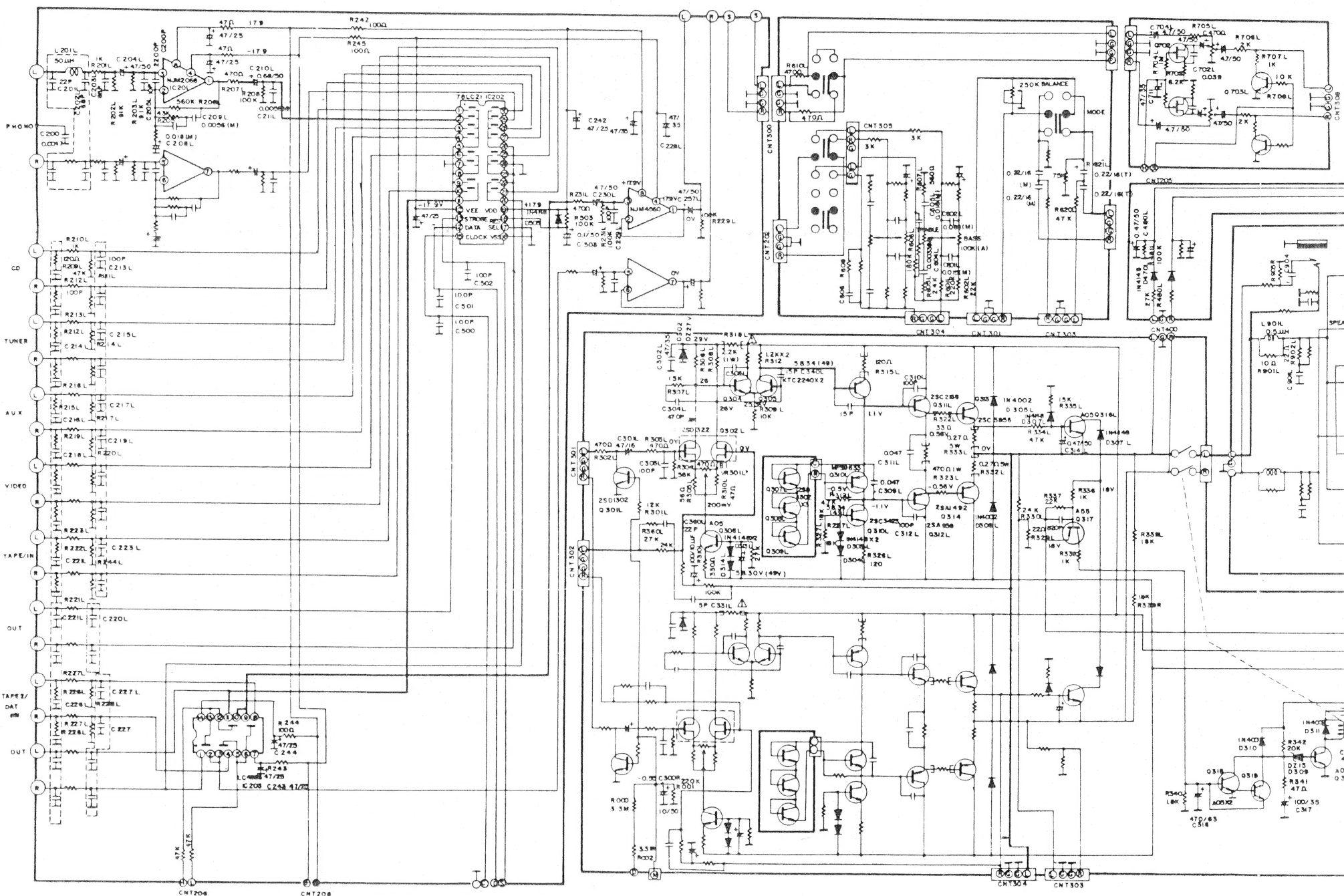
1

2

3

4

5



## SERVICE INFORMATION

1. RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED. (K=1000, M=1,000,000)
2. CAPACITANCE VALUES ARE IN PICO FARADS (P) UNLESS OTHERWISE SPECIFIED. (P=10<sup>-12</sup>)
3. ALL VOLTAGES ARE MEASURED WITH NO SIGNAL AC : VALUE WITH NO SIGNAL DC : R.M.S. (AT 1 KHZ 80% DUTY CYCLE)
4. THE 3-WAY MARKED RESISTORS ARE TO BE USED ON SLEEVES.
5. PRECAUTION  
A) ALL COVERS, SHIELDS AND SHIELDS MUST BE REPLACED BEFORE RETURNING TO SERVICE.  
B) A DAMAGED POWER SUPPLY MUST BE REPLACED BEFORE RETURNING TO SERVICE.  
C) DIELECTRIC TEST SHOULD BE PERFORMED ON ALL APPLIANCES TO CUSTOMER.  
D) SINCE THOSE PARTS MARKED WITH A "P" ARE PARTS FOR SAFETY, USE THEM WITH CARE.

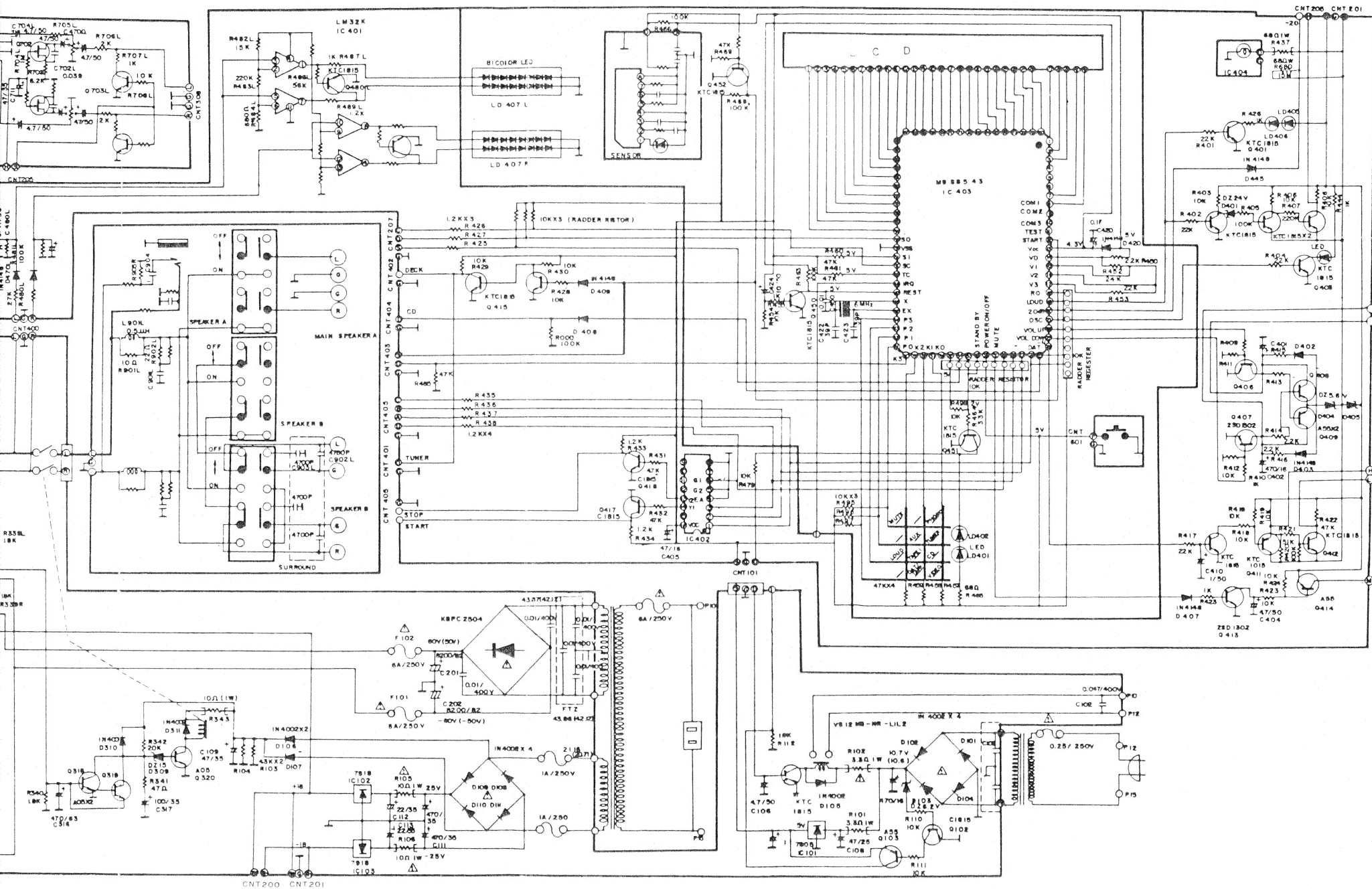
A

B

C

D





# SERVICE INFORMATION

RESISTANCE VALUES ARE INDICATED IN OHMS UNLESS OTHERWISE SPECIFIED. (K=1000, M=1000000)  
CAPACITANCE VALUES ARE INDICATED IN MICROFARADS UNLESS OTHERWISE SPECIFIED. (P=MICRO-MICROFARAD)  
ALL VOLTAGES ARE MEASURED WITH GROUND  
DC : VALUE WITH NO SIGNAL  
 $\Delta$  : R M S (AT 1 KHZ 8 OHM LOAD FULL SIGNAL)  
THE ~~WAVE~~ MARKED RESISTORS ARE MOUNTED ABOVE THE P.C.B ON SLEEVES.

PRECAUTION.

- ALL COVERS, SHIELDS AND INSULATING SPACERS MUST BE REPLACED BEFORE RETURNING APPLIANCE TO CUSTOMER.
- A DAMAGED POWER SUPPLY CORD MUST BE REPLACED BEFORE RETURNING APPLIANCE TO CUSTOMER.
- DIELECTRIC TEST SHOULD BE DONE BEFORE RETURNING APPLIANCE TO CUSTOMER.
- SINCE THOSE PARTS MARKED WITH  $\Delta$  ARE CRITICAL PARTS FOR SAFETY, USE THE ONE DESCRIBED IN PARTS LIST.